

AD-A115 624

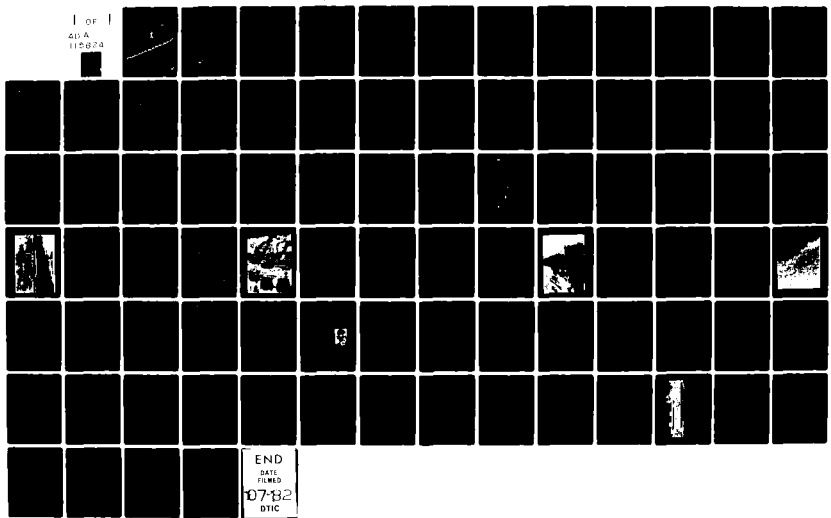
ARMY ENGINEER DISTRICT LOUISVILLE KY
KENTUCKY RIVER AND TRIBUTARIES. UPPER KENTUCKY RIVER NAVIGATION--ETC(U)
NOV 80

F/G 13/2

UNCLASSIFIED

NL

1 of 1
41A
115874



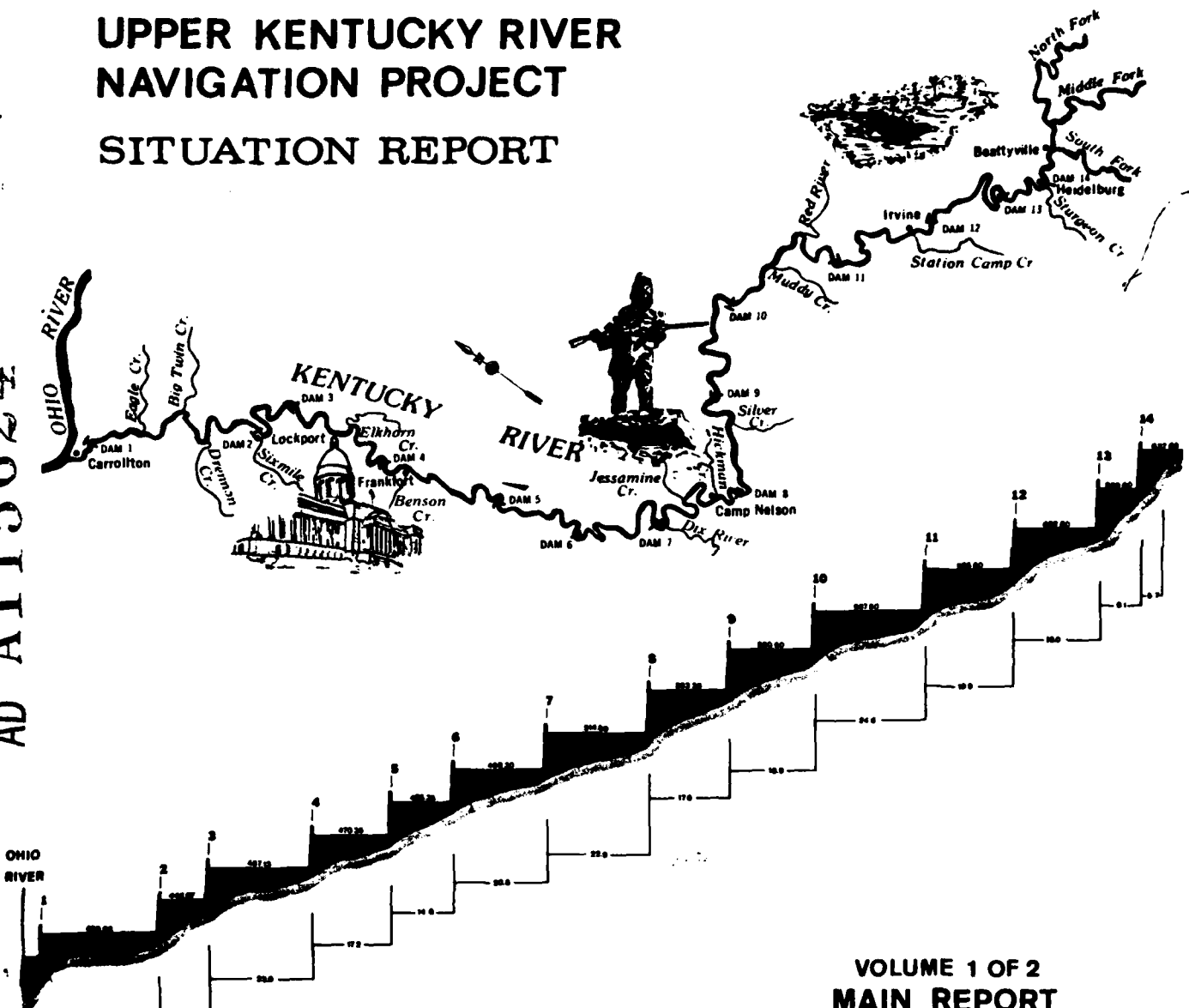
END
DATE
FILMED
07-82
DTIC

KENTUCKY RIVER AND TRIBUTARIES

UPPER KENTUCKY RIVER NAVIGATION PROJECT SITUATION REPORT

①

AD A115624



DTIC FILE COPY

This document has been approved for public release and sale; its distribution is unlimited.

VOLUME 1 OF 2
MAIN REPORT

U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT
LOUISVILLE, KENTUCKY

NOVEMBER 1980

DTIC
S D
JUN 16 1982

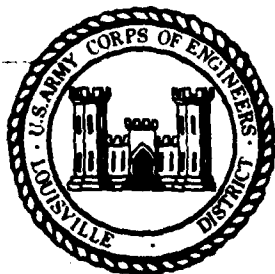
82 06 14 038
A

KENTUCKY RIVER AND TRIBUTARIES

UPPER KENTUCKY RIVER NAVIGATION PROJECT

SITUATION REPORT

VOLUME 1 - SYLLABUS
MAIN REPORT



NOVEMBER 1980

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM	
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. REGISTRY'S CATALOG NUMBER	
	AD-H115	624	
4. TITLE (and Subtitle) Kentucky River and tributaries: Upper Kentucky River Navigation Project		5. TYPE OF REPORT & PERIOD COVERED Situation Report	
7. AUTHOR(s)		6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS USAED, Louisville		8. CONTRACT OR GRANT NUMBER(s)	
11. CONTROLLING OFFICE NAME AND ADDRESS USAED, Louisville (PD-F)		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE November 1980	
		13. NUMBER OF PAGES 2v.	
		15. SECURITY CLASS. (of this report) Unclassified	
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for Public Release; Distribution Unlimited			
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)			
18. SUPPLEMENTARY NOTES Vol. 1--Main Report Vol. 2--Public involvement record			
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Upper Kentucky River Boats and boating Recreation areas			
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Use of the Upper Kentucky River locks is limited to recreation boating, which has declined approximately 50 percent over the period, 1970-1978. Economic analysis indicates that continued operation of Locks and Dams 5-14 does not appear to be justified. From a sociopolitical viewpoint, the project at present benefits 13 communities (324,000 people) for municipal and industrial water supply; benefits 590,000 people per year for recreation and (over)			

15011
Unclassified

SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

boating; benefits 1,500 per year through hydroelectric power.

The local and state support for continuation of locking and other project functions is extremely strong, emotional and vocal.

Cessation of locking would adversely affect the regional economy in terms of 17 lost part-time and full-time job opportunities and \$180,000 loss in direct income and wages.

It is recommended that the Upper Kentucky River (Locks 5-14) remain open for the interim period 1981 through 1985 pending completion of a more comprehensive basinwide study.

Unclassified

B
SECURITY CLASSIFICATION OF THIS PAGE(When Data Entered)

KENTUCKY RIVER AND TRIBUTARIES UPPER KENTUCKY RIVER NAVIGATION PROJECT SITUATION REPORT

SYLLABUS

The Kentucky River Navigation Project, consisting of 14 locks and dams, extends from Carrollton, Kentucky, to near Beattyville, Kentucky, for a project length of some 255 miles. The Commonwealth of Kentucky built Locks and Dams 1 through 5 during the late 1800's. In 1880, these structures became the property of the Federal Government which completed the project in the early 1900's. Average annual tonnage on the Kentucky River during the period 1970-1978 was approximately 549,000 tons consisting of sand movements through the lower four locks only. No commercial traffic has occurred through Locks 5-14 except for a brief period during early 1975. Use of the Upper Kentucky River locks is limited to recreational boating, which has declined approximately 50 percent over the period, 1970-1978.

In view of increasing demands for operation and maintenance funds and manpower resources, the Office of the Chief of Engineers directed preparation of an assessment report pursuant to the authorities provided by the Rivers and Harbors Act of 1909. During the course of the evaluation process, funding of the Upper Kentucky River project's operation and maintenance received a low priority and was subsequently deleted from the Fiscal Year 1981 Budget Request.

As a result of decisions made in preparation of the Fiscal Year 1981 Budget Request and as a means of obtaining public input to the evaluation and decision process, an announcement was issued on 1 April 1980 stating that the Louisville District was considering the cessation of locking at Locks 5-14 (at the end of the 1980 recreation season -- 1 November 1980). A public meeting was subsequently held on 26 June 1980 in Lexington, Kentucky, to provide the public with further opportunity to comment on the proposal and provide input to the proposed action. The volume of response to the initial announcement totaled 150 letters, followed by attendance at the public meeting of approximately 480 people.

The existing project, defined as Plan 1 - Continue Current Operations at L&D's 5-14, was analyzed in terms of annual cost, over a 5-year period, versus its adverse and beneficial effects. This produced an average annual cost of \$1,779,000; commercial navigation benefits of zero, and recreation benefits of \$929,000. The addition of benefits (traditionally measured) for the incidental project purposes of water supply and hydropower (annual equivalent benefits of \$310,000 and \$260,000, respectively, are creditable to the dams and pools, but not the lock operation.

In excess of six alternative operation-management options were identified, including: (1) suspend locking at 5-14, (2) locking by appointment, (3) continued operation, (4) combination plans, (5) user fees, and (6) operation by other Federal or state agencies. Annual costs of operation and maintenance for these alternatives ranged from \$420,000 to \$2,200,000 per year for Locks and Dams 5 through 14. For various reasons, including lack of authority, inability to implement in the short term, and similarity of plans, the number was reduced to three plans which were selected for detailed evaluation and impact analysis. These plans and a summary of pertinent decision criteria are shown on Illustration 1.

Conclusions drawn from the economic analysis that are due to the antiquated nature and configuration of the Upper Kentucky River system and because commercial navigation has ceased and recreational boating is declining, operation of the project (Locks and Dams 5-14) does not appear to be justified.

However, from a sociopolitical viewpoint and a broader national economic viewpoint, the project at present:

- benefits 13 communities or 324,000 people for municipal and industrial water supply
- benefits 590,000 people per year for recreation and boating
- benefits 1,500 people per year through hydroelectric power

The local and state support for continuation of locking and other project functions is extremely strong, emotional, and vocal. Recent fiscal actions by the Congress support this view. Although the cessation of locking would not preclude the water supply or hydropower benefits, it would adversely affect the regional economy in terms of 17 lost part-time and full-time job opportunities, and \$180,000 loss in direct income and wages. Cessation of locking would eliminate or severely constrain the unique experience of pleasure boats locking through the historic system and seeing the Kentucky River Palisades, Shakertown, and Boonesboro by water.

It is, therefore, recommended that subject to the provision of funds for continued operation and maintenance, the Upper Kentucky River (Locks 5-14) remain open for the interim period 1981 through 1985 at which time completion of the more comprehensive basinwide study will provide recommendations for ultimate disposition of the project.

ILLUSTRATION 1

PLAN EVALUATION AND DECISION MATRIX

Major Decision Criteria	Plan 1		Plan 2		Plan 4	
	Continue Current Operation 5-14	Suspend Locking 5-14	Continue Current Operation 5-14	Suspend Locking 5-14	Continue Current Operation 5-14	Suspend Locking 5-14
ANNUAL COST						
Financial Charges (O&M)	\$ 1,779,000	\$ 420,000	\$ 1,035,000	\$ 2,082,000		
PRESENT WORTH DEFERRED MAINTENANCE 1/	1,198,000	\$ 4,555,000				
ANNUAL BENEFITS						
Authorized Purposes - Traditional Measure	\$ 930,000	\$ 730,000	\$ 890,000			
Authorized & Incidental Purposes - Traditional Measure	\$ 930,000	\$ 720,000	\$ 890,000			
Recreation	310,000	310,000	310,000			
Water Supply	260,000	260,000	260,000			
Hydropower	260,000	260,000	260,000			
Total	\$1,500,000	\$1,200,000	\$1,480,000			
REGIONAL INCOME	--	\$180,000 annual direct income and wages lost	\$85,000 annual direct income and wages lost			
REGIONAL EMPLOYMENT	--	17 part-time and 1 permanent job opportunity lost (direct)	11 part-time and 1 permanent job opportunity lost (direct)			
RECREATION-HISTORIC EXPERIENCE	Offers unique experience in locking and seeing palisades, Shakertown, Boonesboro by water	Unique experiences eliminated or significantly constrained	Unique experiences essentially retained			
ENVIRONMENTAL	Short-term, localized turbidity, fish disruptions and relocations	Adverse, short-term, localized impacts eliminated	Adverse, short-term, localized impacts 40 percent eliminated			
PRIMARY BENEFICIARIES (No. of People)						
Recreation 1/ (basin, region, outside-state)	620,000	490,000	590,000			
Water Supply 1/ (within basin)	324,000	324,000	324,000			
Hydropower 1/ (within basin)	1,500	1,500	1,500			
	2/	2/	2/			

1/ Present worth of increment in FY 1981 in maintenance 1986-1990 compared to optimum level funding.

2/ Not directly additive due to significance of multi-benefits/person.

KENTUCKY RIVER AND TRIBUTARIES UPPER KENTUCKY RIVER NAVIGATION PROJECT SITUATION REPORT

Table of Contents

Item	Page
SYLLABUS	a
INTRODUCTION	1
Study Authority	2
Purpose of the Report	2
Scope of the Study	2
Other Related Studies	4
PROJECT DESCRIPTION	5
History	5
Early Proposals 1792-1815	5
Channel Improvements 1816-1835	6
Slackwater System 1835-1880	7
Federal Involvement 1880-Present	8
Capacity and Operating Characteristics	9
Lower River Data (L&D's 1-5)	9
Upper River (L&D's 6-14)	11
Operation and Maintenance Costs	13
Historical	13
Present	16
CURRENT PROJECT USE	19
Commercial Navigation	19
Historic Traffic	19
Future Traffic	21
Permit History (Docks)	22
Hours of Operation	22
Project Recreational Visitation, Recreational Boating, and Small Boat Navigation	24
Water Supply	30
Historical and Existing Use	30
Local Interests and Desires	35
Existing Demands and Projections	35
Hydropower	37
Flood Control	37

Table of Contents (Continued)

<u>Item</u>	<u>Page</u>
Environmental Considerations	39
Existing Environmental Setting	39
Environmental Effects of the Present Project	39
Areas of Special Concern	40
Historical Features	40
Natural and Scenic Features	41
PUBLIC INVOLVEMENT	43
ALTERNATIVES	49
Initial Screening	49
Plan 1 - Continue Current Operation	49
Plan 2 - Suspend Locking Operations - Locks 5-14	50
Plan 3 - Locking by Appointment - Locks 5-14	54
Plan 4 - Continue Current Operation (5-10) - Suspend Locking at 11-14	54
Plan 5 - Continue Current Operation at 5-10 - Lock by Appointment at 11-14	55
Plan 6 - Lock by Appointment at 5-10 - Suspend Locking at 11-14	55
Other Alternatives	55
Summary-Alternatives	57
ALTERNATIVES EVALUATION	58
General	58
Evaluation Criteria	58
Annual Costs	58
Present Worth of Deferred Maintenance	58
Recreation Benefits	60
Summary	63
Incidental Purpose Benefits	63
Socioeconomic Factors	63
Dock and Marina Income/Employment Losses	64
Federal Income/Employment Losses	65
Environmental Considerations	65
Historical, Scenic, and Natural Values	66
DISCUSSION	69
CONCLUSIONS	71
RECOMMENDATIONS	74

Table of Contents (Continued)

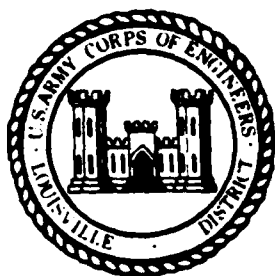
List of Tables

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Calculation of Kentucky River Annual Lock Capacities	12
2	Operation, Maintenance, and Major Replacement Costs - Kentucky River	14
3	Defined OM&R Funding Levels	18
4	Kentucky River Waterborne Traffic	20
5	Current Operation Schedule	24
6	Annual Visitors, L&D 5-14	25
7	Kentucky River Boat Ramps	25
8	Pleasure Craft Lockages, L&D 5-14	27
9	Total Project Visitation Estimate, L&D 5-14	30
10	Water Supply Data	34
11	Computation of Incidental Water Supply Benefits Creditable to Pool Maintenance	36
12	Alternative Plan Definitions	51
13	Detailed Estimates of OM&R Costs for Plans	52
14	Plan Evaluation and Decision Matrix	59

Table of Contents (Continued)

List of Figures

<u>Number</u>	<u>Title</u>	<u>Page</u>
1	Study Area	3
2	Comparative Tow and Lock Sizes	10
3	Locking of Pleasure Craft, Kentucky River, Locks 5-14	23
4	Dixie Bell	29
5	Surface Water Source Withdrawals, Municipal and Power Plants	32
6	Kentucky River Water Intake, Pool 9	33
7	Kentucky River Lock and Dam 7	38
8	Kentucky River Palisades	42
9	Lexington Leader Newspaper Article dated 14 April 1980	46
10	Woodford County Sun Newspaper Article dated 3 July 1980	47
11	Lexington Herald Newspaper Article dated 27 June 1980	48
12	Boonesboro State Park	63



November 1980

KENTUCKY RIVER AND TRIBUTARIES UPPER KENTUCKY RIVER NAVIGATION PROJECT SITUATION REPORT

INTRODUCTION

The Kentucky River is formed by the confluence of its North, South and Middle Forks near Beattyville, Kentucky. It flows in a northwesterly direction from the mountains of eastern Kentucky to the Ohio River at Carrollton, Kentucky. A system of 14 locks and dams was constructed on the river by the Commonwealth of Kentucky and by the Federal Government in the late 1800's and early 1900's. This navigation system provides a six-foot deep navigable channel from Carrollton to Beattyville, a river distance of approximately 255 miles. For the most part, commercial navigation operations on the Kentucky River have not been profitable and commercial tonnage moving on the Kentucky River has declined. The only commercial traffic on the river for a number of years has been movement of sand and stone through Locks 1 - 4. There has been no commercial towing upstream of Lock 4 except for a brief period during early 1975 when a small amount of coal was transported. The average annual tonnage on the Kentucky River (Locks 1 - 4) during the period 1970-1978 was approximately 549,000 tons. Further, use of the Kentucky River for recreational boating declined during the period from 1970-1978 by approximately 50% and the preponderance of recreational boating lockages were through the lower four locks. In contrast, the cost of operating and maintaining the Kentucky River navigation system had not declined and has, in fact, substantially increased during recent years. It has been necessary to allocate substantial amounts of manpower and money to operate these facilities and to maintain them in a safe and operable state. In an effort to make better use of limited operation and maintenance funds and manpower resources, consideration has been

given to the cessation of locking operations at Locks 5 through 14 on the Kentucky River. Only this portion of the Kentucky River navigation project has been considered for closure since it is not being used for commercial navigation, whereas Locks 1 through 4 are utilized at least to some extent for their authorized purpose. This consideration resulted in a determination by the Office of the Chief of Engineers in February 1980 to require preparation of an assessment and report on the matter with available operation and maintenance funds during fiscal year 1980.

STUDY AUTHORITY

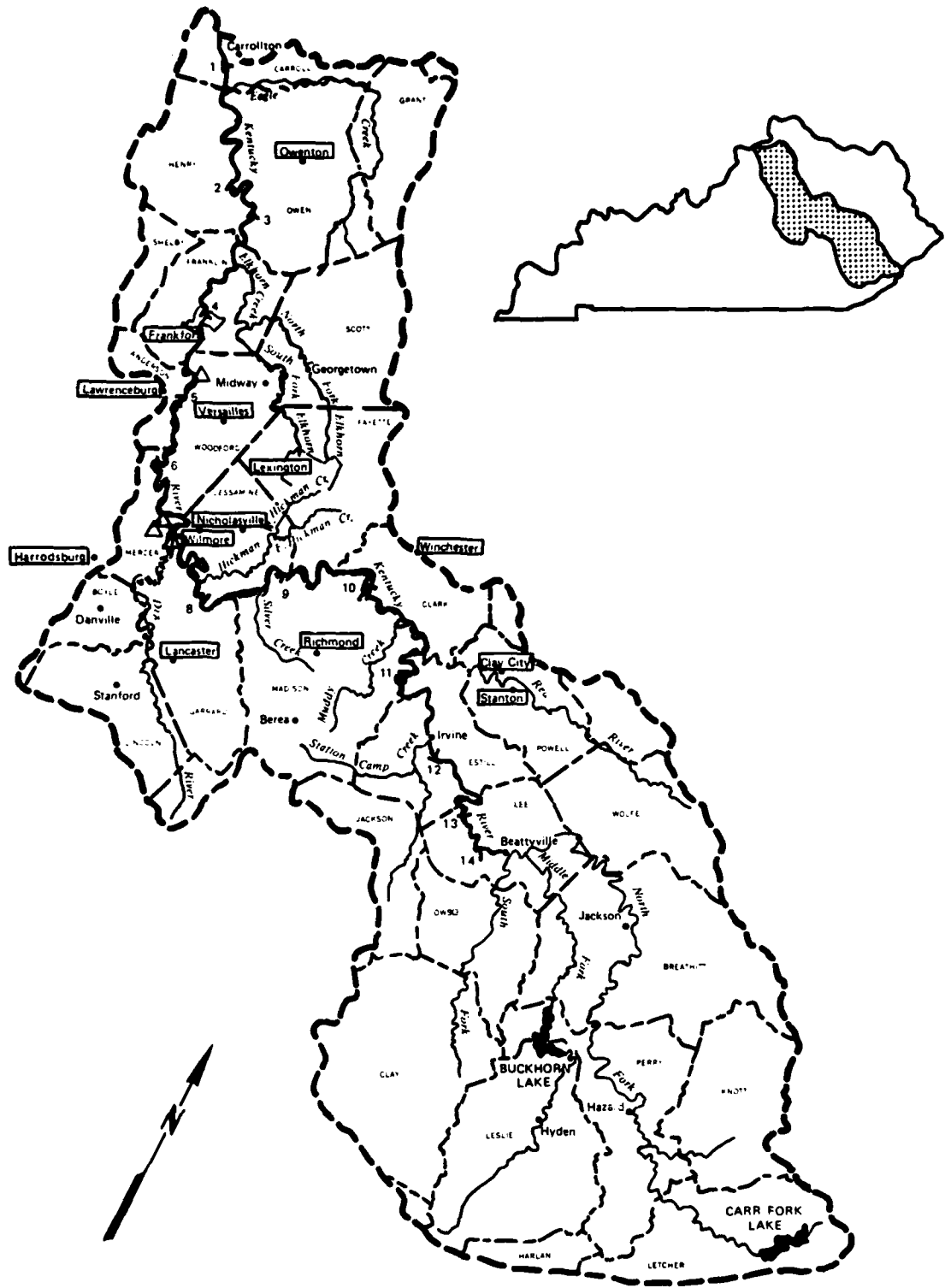
The above-mentioned administrative decision by the Chief of Engineers pursuant to authorities provided by the Rivers and Harbors Act of 1909 (Public Law No. 317) constitutes the necessary authority for the preparation of this report. The report was prepared utilizing funds from the Operations and Maintenance appropriation.

PURPOSE OF THE REPORT

During preparation of the Fiscal Year 1981 President's Budget, the assignment of priorities based on fiscal and manpower restraints resulted in continued operation and maintenance of the Upper Kentucky River Locks and Dams Project receiving a low priority. As a result, funds were not included in the final or amended budget request. This report, therefore, contains an assessment of the impacts of various alternative management measures for reduction in the level of funding (which would require reduced service) at Locks and Dams 5 through 14. That evaluation and assessment is presented in this report as a basis for the recommendations contained herein and is provided for review and approval by higher authority and for the public as appropriate.

SCOPE OF THE STUDY

Geographically, this interim study addresses the Kentucky River Navigation Project, Locks and Dams 5 through 14 (see Figure 1). Locks and Dams 1 through 4, the region and the nation are considered only to the extent that project area impacts or affects of the considered action are in these larger areas.



**KENTUCKY RIVER BASIN
UPPER KENTUCKY RIVER SITUATION REPORT**

STUDY AREA

**U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.**

ORLPD-F

The scope of this study and report is limited to an evaluation of the impacts and effects of closing or in some way modifying the existing operating schedules of Locks and Dams 5-14 on the Kentucky River (see Figure 1). The study does not consider the effects of any changes in present operating schedules of Locks and Dams 1-4, nor does it consider other water and related resource needs of the Kentucky River Basin. The scope of this study is also limited by the deliberate planning constraint that any recommended action would be considered as an interim or temporary action, to apply only during the period from the present to completion of the Kentucky River and Tributaries Survey Investigation now underway. Accordingly, the evaluation period considered throughout this report is 1981-1985. This period will extend one year beyond the scheduled completion date of the basinwide Kentucky River and Tributaries Survey Investigation. This basinwide comprehensive investigation will address the question of ultimate improvement, retention, modification, or disposal of the entire Kentucky River lock and dam system. The present special report, therefore, is limited to consideration of temporary management measures, the impacts of which will accrue in the 1981-1985 time period.

Assessments of impacts of the alternative actions include those creditable in accord with the commercial recreation and navigation authorized purposes as well as other social, economic, and environmental aspects actually affected.

OTHER RELATED STUDIES

Other studies, completed or ongoing, from which data and information have been obtained are as follows:

Final Environmental Impact Statement, Operation and Maintenance, Kentucky River Navigation Project, October 1975;

Flood Control Alternatives to Red River Lake, Special Report, July 1976;

Water Supply Alternatives to Red River Lake (2 vols.), Special Report January 1978; and

Metro-Lexington Urban Water Resources Study, September 1978.

PROJECT DESCRIPTION

HISTORY

The rivers of Kentucky, unlike the roads, received no attention from the State of Virginia, except that mill dams and ferries were instituted and controlled. Kentucky, upon becoming a State in 1792, assumed jurisdiction of streams within its borders and maintained authority over the Kentucky River until 1880.

Early Proposals 1792-1815

Open channel work to secure safety of navigation on the Main River and the South Fork constituted the first comprehensive project proposals. In 1792 and 1795, channel work was discussed in the legislature. In July 1799, a report of a survey of the river and plans for improvements were presented during a constitutional convention. In no case was any action taken. On 19 December 1801, "The Kentucky River Company," a joint-stock concern, was chartered by the legislature. The Company, capitalized by various counties contiguous to the river and directed by State-appointed commissioners, was authorized to clear the Kentucky, from its mouth to the mouth of South Fork, of all barriers which the commissioners judged would "impede or obstruct the passage of boats," and of such other hindrances, the removal of which would be "absolutely necessary to improve navigation." The imposition of fines for further obstructions and the right to collect tolls was granted to the company. No work was accomplished.

On 10 January 1811, an act established a lottery to raise \$10,000 to be expended by 11 State-appointed commissioners on the Main River to the mouth of South Fork and on South Fork and its chief tributary, Goose Creek, as far as the salt works of James Garrard and Sons in Clay County. Commissioners were appointed the following year (and again in 1813) to direct the channel work. A 3-year extension was granted in which to complete the work. No work was accomplished.

During this time, county courts and special acts of the legislature allowed an increase in the number of mill dams and public ferries, both of which hindered general navigation.

Channel Improvements 1816-1835

A committee report submitted to the Kentucky Senate on 21 December 1816 included the Kentucky among the four rivers of greatest consequence to the State. On 28 January 1818, \$10,000 was allotted out of State appropriations for waterway improvement. The river was divided into three "precincts," and each placed under a commissioner. During the next year \$7,000 was expended. Obstructions were removed and, in some places, dams were built of rocks, brush, and logs which, by narrowing the channel, deepened the water at low stages.

Between 1818 and 1835, a number of laws to benefit navigation were enacted. Little work was actually performed.

During the decade following 1835, the Board of Internal Improvement expended \$8,000 to improve the upper river. Sixty-five mill and fish dams were removed between Frankfort and South Fork, but most of the money was spent on the three Forks to benefit the expanding salt, coal, and timber industries.

These early efforts were directed toward the removal of obstructions to navigation: mill dams, fish dams, snags, and other channel improvements. Later efforts would concentrate on canalization and the development of the slackwater navigation system which now operates on the Kentucky River.

The first systematic survey of the Kentucky was made in 1828, under the direction of the War Department of the Federal Government, at the request of the State. This survey covered a 178-mile section from the mouth to Boonesborough and had as its purpose the determination of the relative merits of canalization and regularization. The report recommended to Congress on 6 January 1829 that an experimental dike be constructed near Frankfort at a cost of \$10,704. The proposed legislation containing the recommendation was vetoed by President Andrew Jackson.

Slackwater System 1835-1880

The State Board of Internal Improvement surveyed the upper river between 1835 and 1838. It advised a complete slackwater system extending from the mouth of the Main River to Middle Fork and up the three Forks. The main stream work would have required 17 locks and dams to provide a 6-foot depth sufficient for medium-sized steamboats. The North and South Forks were to be made navigable for smaller steamboats; the Middle Fork, because it was narrow and crooked, was not considered suitable for use by steamboats, but 68 miles of slackwater were proposed for the use of coal boats.

Only that part of the plan which related to the Main River was adopted. Between 1836 and 1842, the five lower locks were constructed creating 95 miles of slackwater. However, steamboats could use only 66 miles of this during high water due to two low bridges at Frankfort. By 1842, Locks 1 through 5 were officially opened and passed 114,780 tons of commerce that year, but the project was not a financial success. The projected 6-foot depth was not attained because of errors in the placement of miter sills; inferior construction materials necessitated constant repairs and injudiciously located locks required continual expensive dredging. During a period of 24 years (1843 to 1866), the net revenue from the project provided an average annual return of a fraction of 1 percent on the investment.

In January 1852, "The Kentucky River Navigation Company" received a charter for the building of locks and dams to complete the system. Work was to commence within 2 years and unless finished by 1 January 1861, the charter was to be forfeited. In 1865, another company by the same name received a new charter. The counties which would be benefited by the new works were to subscribe for stock in the company and funds for the extension were to be raised by county taxes levied by popular vote. In 1869, the State leased to the Company the Kentucky River for a period of 50 years; the Company failed; the State Court of Appeals declared county subscriptions unconstitutional. Thus, although monies (\$700,000 in county subscriptions) had been paid over to the Company and spent, no extension of the works resulted.

The slackwater system was used during the Civil War, but it deteriorated greatly from lack of proper maintenance. After 1876, the works were practically abandoned and regular navigation stopped. By the close of the State-sponsored and controlled period, the entire system, except the substantially built locks, was worthless. The pools were debris-filled, the two lower dams were in ruins, and the rest were rotten from comb to foundation.

Federal Involvement 1880-Present

The first Federal appropriation for the Kentucky River (\$100,000) was contained in the Rivers and Harbors Act of 3 March 1879, but the work of improvement could not be commenced until title to the locks and dams built and owned by the State of Kentucky was passed to the United States. The Kentucky Acts of 1880 (Chapter 58, approved 24 January 1880, and Chapter 509, approved 22 March 1880) conveyed those structures and the right of acquisition of any lands, buildings, or other property necessary for the extension of the navigation system.

Thus, in May 1880, the Federal Government resumed the work which the State had been forced to abandon. By March 1882, navigation was reopened through rehabilitated Locks 1 through 4. The remaining ten locks and dams were opened continuing upstream as follows: No. 5 in 1886, No. 6 in 1891, No. 7 in 1897, No. 8 in 1900, No. 9 in 1903, No. 10 in 1905, No. 11 in 1906, No. 12 in 1910, No. 13 in 1914, and No. 14 in 1917.

By 1900, a total of 24 steamboats operated on the Kentucky River. Fourteen of these were passenger-carrying packet boats. However, by this time, very little coal was transported by barge due to growth of rail service. After the turn of the century, water transportation declined steadily, reaching a low by the time Lock and Dam 14 was completed in 1917.

The expenditures for the slackwater system have been much in excess of the original estimates due to of engineering difficulties which proved greater than anticipated. The old works required a virtual rebuilding. Flood and ice interfered seriously with the construction of new works, and washouts and other damages necessitated expensive additions for maintenance. During March 1905, severe floods washed out the banks behind the landwalls of Locks and

Dars 9 and 10, with loss of both pools. Auxiliary dams restored those pools by December 1906.

Thus, in contrast to other commercial navigation units of the inland waterways system, navigation on the Kentucky River has never realized its envisioned potential and the historical diseconomies when limited to navigation extend to the present day. Present day operating characteristics, condition, and project use are described in more detail in the following sections.

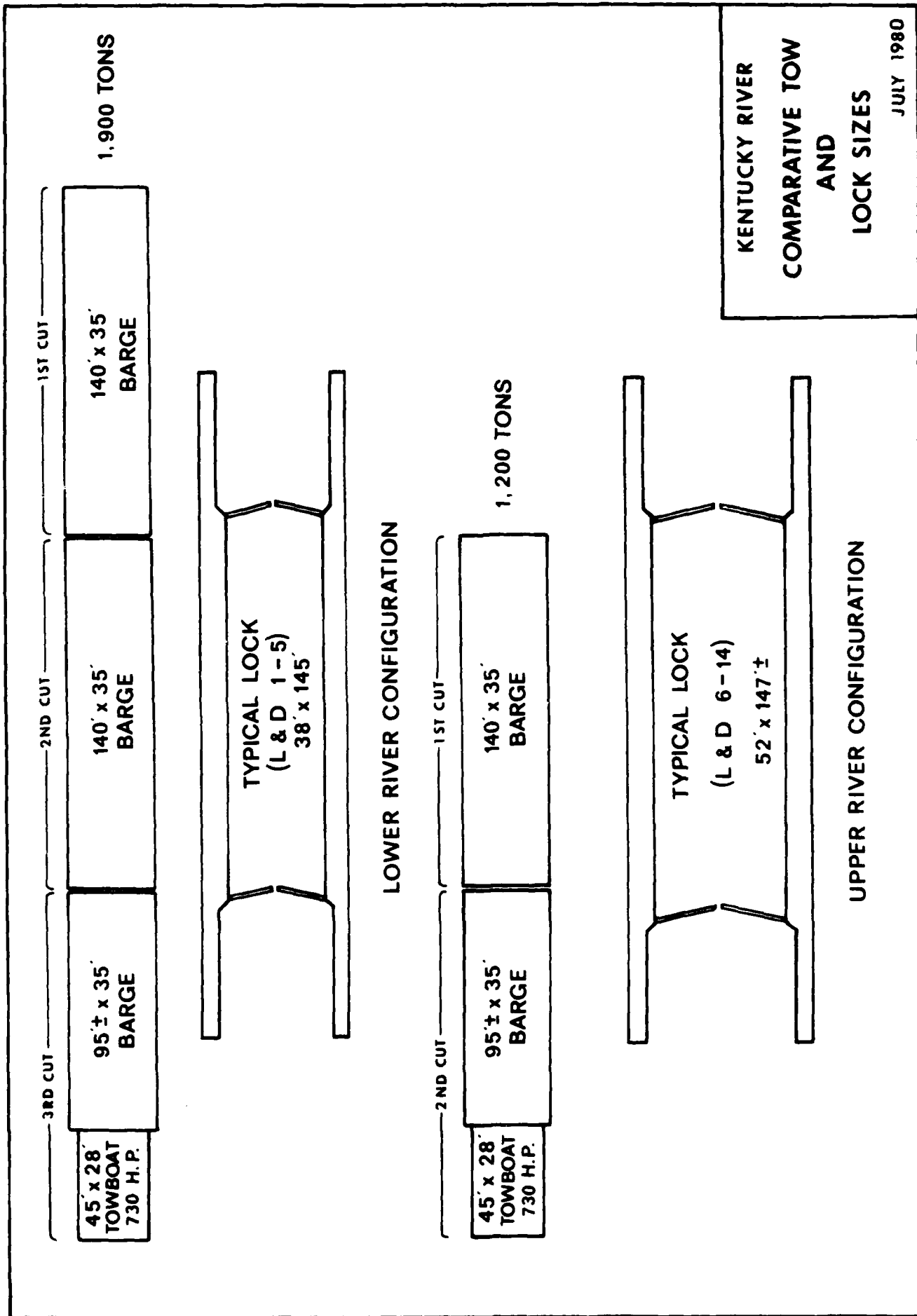
CAPACITY AND OPERATING CHARACTERISTICS

L&D's 1-5 are the oldest and smallest locks on the Kentucky River. The size of the chambers are 38' x 145' with a minimum sill depth of 6.1 feet. L&D's 6-14, built around the turn of the century, are newer and somewhat larger. These have chamber dimensions of 52' x 147' (more or less), with minimum sill depths of about 6 feet. The authorized channel depth along Kentucky River is 6 feet, allowing generally for barge loadings to a 5.5 foot draft. Channel widths are not officially defined, but are probably more than adequate for any Kentucky River commercial traffic considering the small depth and sizes of locks involved.

In general, tow and barge sizes are limited by two factors: (1) minimum lock chamber dimensions of 38' x 145' at L&D's 1-5, and (2) standard barge fabrication widths of 35'. The barges used on Kentucky River are shorter than those on any other portion of the inland waterway system (including the Monongahela and Kanawha Rivers), and in most cases require special construction.

Lower River Data (L&D's 1-5)

A typical tow on the lower river consists of two long and one short barge, together with a 45' X 28' towboat. The 100' X 35' barges can hold about 700 tons of material; the 95' X 35' barge can hold about 500 tons. Accordingly, these tows allow for a total loading of 1,900 tons per tow, and require a triple-lockage; a maximum loading of 1,900 tons may be assumed



regardless of commodity considered. The tow configurations shown in Figure 2 are probably the largest and most efficient that could be used on the existing Kentucky River.

Assuming a 24-hour per day lock, operating for 365 days per year, consideration of downtime, an average lockage time of 100 minutes (triple-lockage), with 1,900 tons per tow, and typical 50 percent empty tows, the theoretical maximum capacity of Locks 1-5 may be estimated at 4.2 million tons per year, as shown in Table 1. The travel time between the Kentucky River mouth and Frankfort (65 miles) may be estimated at 17.5 hours, considering the above lockage times and an average tow speed of 6.0 miles per hour.

Upper River Data (L&D's 6-14)

In the upper river channel constraints on commercial navigation are more restrictive than lock size. Although the locks are larger, barge and towboat equipment which might be used for transportation of coal or other commodities on the Upper Kentucky River would probably be of the same or similar sizes as those above. However, due to narrower channels and sharper bends in the reaches between pools 10 and 14, tows in this area would probably be limited to a 2-barge operation. As shown in Figure 2, these tows would probably consist of a 140' x 35' barge, a 100' x 35' barge, and a 45' x 30' towboat. Such a tow could haul 1,200 tons.

Assuming a 60-minute lockage time (double-lockage), with 1,200 tons per tow and 50 percent empty tows, the theoretical maximum physical capacity of Locks 6-14 may be estimated at 4.6 million tons per year. The transit time between Beattyville (Mile 255) and the Ford Generating Plant (Mile 177) would be about 17 hours, considering average speeds of 6.0 miles per hour and four double-lockages requiring one hour apiece. A one-way trip from Beattyville to Frankfort (Mile 65) would require about 42 hours.

TABLE 1
CALCULATION OF KENTUCKY RIVER ANNUAL
LOCK CAPACITIES

	Locks 1-5	Locks 6-14
Time per year (minutes = 365 x 24 x 60)	525,600	525,600
Downtime (minutes, based on 10%)	52,560	52,560
Time for recreational lockages ^{1/}	30,000	10,000
Net available time per year	443,040	463,100
Average lockage time (minutes)	100	60
Average tons/loaded tow	1,900	1,200
Percent empty tows	50	50
Average tons/all tows	950	600
<u>Annual Capacity</u> ^{2/}		
Tons/year	4,208,500	4,631,000
Barges/year	13,290	15,436
Tows/year	4,430	7,718

^{1/} Considers recreational usage for year 1976 at critical lock -- 1,500 lockages at L&D 1, 500 lockages at L&D 6; 20 minutes per recreational lockage.

^{2/} Capacity (T/year) =

$$\frac{\text{avg loading (tons/tow)} \times \text{net available time } \left(\frac{\text{min}}{\text{yr}}\right)}{\text{processing time (min/tow)}}$$

OPERATION AND MAINTENANCE COSTS

Historical

While normal operation and maintenance (OM) costs, generally reflecting supplies and salaries, have grown at an annual compound rate of about 8 percent over the period 1970 to 1980 as shown in Table 2, total OM&R (including major replacement) have grown at about 16-1/2 percent. The normal OM costs have closely followed the rate of inflation over this time period, unlike those costs containing major replacement items, which clearly reflect the increasing demands for maintaining a deteriorating, antique system of locks and dams. Of the total cost of \$18.8 million required to operate and maintain the Kentucky River Navigation Project over the period 1970 to 1980, costs are distributed approximately 46 percent to Locks and Dams 1-4 and 54 percent to Locks and Dams 5-14.

The nature of repairs and maintenance to the Kentucky River structures during recent years provides an indication of upcoming requirements throughout the system. The following selected samples provide an explanation of the type and nature of major maintenance items as required to maintain the structures in a safe and operable condition.

1978-80 - New Upper Guardwall and Repairs to Dam No. 1

The upper guardwall had deteriorated to the extent that it was no longer serving any useful purpose. It was removed and a new 4-cell wall composed of circular steel sheet pile cells, filled with stone and capped with concrete, was installed. The wall has steel rubbing beams for tows to tie up to when locking. Dam repairs were made similar to those described below for L&D No. 2 in 1980. Similar upper guardwall repairs at No. 2 were done in 1977-78.

TABLE 2

OPERATION, MAINTENANCE, AND MAJOR
REPLACEMENT COSTS - KENTUCKY RIVER

Fiscal Year	Locks 1 through 4			Locks 5 through 14		
	Total	Normal		Total	Normal	
		O&M	Rehab		O&M	Rehab
1970	281.2	201.2	80.0	622.5	422.5	200.2
1971	238.5	238.5	-	682.9	502.9	180.0
1972	395.7	245.7	150.0	613.8	548.8	65.0
1973	575.7	315.7	260.0	595.9	500.9	95.0
1974	711.8	296.8	415.0	807.3	607.3	200.0
1975	842.5	352.5	490.0	864.1	664.1	200.0
1976	396.6	396.6	-	1,328.0	778.0	550.0
1977	1,084.6	334.6	750.0	844.5	844.5	-
1978	1,366.2	396.2	970.0	1,698.8	748.8	950.0
1979	1,532.2	732.2	800.0	849.2	849.2	-
1980	<u>1,300.7</u>	430.7	870.0	<u>1,176.7</u>	1,176.7	-
11 year Total	8,725.8			10,083.7		

1980 - New Upper Guidewall and Dam Repair at No. 2

The upstream end of the upper guidewall had deteriorated such that old concrete buttresses were all that were left. A new wall will add 78 feet to existing upper guidewall and will provide ample space for tows to tie off during locking procedures.

The dam is a stone-filled timber crib capped with concrete. Due to cracking, settling, and general deterioration of the concrete, repairs to the dam were needed. A steel piling wall is being driven adjacent to the upstream face of the dam to prevent leakage through the dam, erosion, settling, and cracking.

1978 - New Upper Guidewall at Lock No. 10

The old upper guidewall was made of large creosote-treated poles which were driven into pile clusters, with a walkway fastened to the top of the piles. The wall was in a badly deteriorated and totally unusable condition. A new upper guidewall was constructed by driving steel beams into the river bed and fastening steel rubbing beams with a walkway.

The second aspect of OM&R costs is that portion defined as "normal" operating costs. The major portion of normal operating costs is due to hired labor which at present involves 11 Full Time Permanent (FTP) positions and 10 Temporary Part Time (TPT) positions. The 11 FTP positions include one lockmaster at each lock site (Locks 5-14) and one roving lock operator who is stationed at Lock No. 10, but who is utilized on Locks 5 through 14 to cover for vacation and sick leave. "Normal" operating costs are difficult to define. For the purpose of this analysis, they are defined as those base costs for hired labor and supplies and limited maintenance plus supervision, administration, and overhead costs.

Costs experienced over the years that can be identified as above normal levels would include items such as the extensive hired labor requirements required in 1979 (See Table 2), following the December 1978 record flooding on the Kentucky River, after which considerable repair, cleanup, and dredging were required to restore parts of the project to an operational status.

Present

An example of operation and maintenance costs for a representative year is shown in Table 3. The costs shown were developed during early consideration for the Fiscal Year 1981 budget request. Funds were subsequently deleted because of low national priority for the Upper Kentucky River.

Operation and maintenance costs over a 10-year period (October 1980 price levels) total \$22.0 million made up as follows:

Operating Costs - \$594,000/yr X 10 yrs =	\$ 5,940,000
Channel clearing and Buoy	
Maintenance \$200,000/y X 10 yrs =	\$ 2,000,000
Lock and Dam Repairs and	
Maintenance \$900,000/lock at 1 lock/yr =	\$ 9,000,000
Other Facility Maintenance and	
ED & SA - \$500,000/yr	= \$ <u>5,000,000</u>
	\$ 21,940,000
	Rounded = \$ 22,000,000

Examples of work needed at the locks and dams on the Upper Kentucky River in order for them to remain operational over the next 5 years are as follows:

Repairs must be accomplished at one lock per year as a minimum. This would consist of dewatering the lock chamber and repairing both upper and lower lock gates; replacing sill, miter, and quoin timbers; reworking, filling and emptying valves; and replacing or repairing electric lines to both the land and river walls.

At Locks and Dam 5 and 7, the following work is needed within the next 2 years. The upper gates at Lock 5 and the lower gates at Lock 7 are presently in need of repair. Repairs would include replacing any steel in the gate that is in a deteriorated condition; possibly sandblasting and painting the gates; replacing the quoin and miter timbers; replacing the sill timbers; reworking the valves and pintles; reworking the gate and valve machinery; repairing or replacing electric lines; and other repairs which may be deemed necessary.

The dam at Lock 5 appears to be in stable condition, but should have a steel sheet piling wall driven adjacent to the upstream face of the dam to prevent erosion through the dam. The dam at Lock 7 has a steel sheet piling wall above the dam, but there are voids and cracks in the downstream slope which should be repaired.

The basic assumption for an estimated \$22.0 million in costs is in accord with prior directives, that existing pool levels will be maintained through continued structural maintenance on the locks and dams. Over the 10-year period, this would equate with the "Optimum" level of funding identified in Table 3 as \$2,200,000 per year. This level of funding allows repair of equipment and structures in advance of expected failure and would, at the end of 10 years, place the system in a sound condition.

The "intermediate" level of funding, shown in Table 3 as \$1,779,000 per year, generally permits maintenance to keep pace with needed equipment and structural repairs. Advance maintenance is not performed and the structures can be kept operational. Less critical maintenance and replacement is deferred until such time as operation and safety standards become impaired. The intermediate level of funding corresponds with the Fiscal Year 1981 appropriation and allocation.

The third level of maintenance defined in Table 3 is the "minimum" level at \$1,413,000 per year. At this level, only critical maintenance needs are met and all other needed maintenance and replacements are deferred.

TABLE 3
 DEFINED OM&R
 FUNDING LEVELS
 (\$1,000)

Cost Items	Optimum	Intermediate	Minimum
<u>OPERATING COSTS</u>			
Hired Labor			
Full Time Permanent	\$292	\$292	\$292
Temporary Part Time	96	96	96
Operating Supplies	30	30	30
Maintenance of Bldgs, Grounds & Utilities	56	56	56
Water Control Management	16	16	16
USGS	26	26	26
Supervision & Administration	60	60	60
Operating Equipment	<u>18</u>	<u>18</u>	<u>18</u>
Subtotal, Operating Costs	\$594	\$594	\$594
<u>MAINTENANCE AND MAJOR REPLACEMENT COSTS</u>			
Channel Clearing, Buoys	\$200	\$200	\$200
Major Maintenance	1,300	900	549
Engineering & Design	26	20	15
Supervision & Administration	<u>80</u>	<u>65</u>	<u>55</u>
Subtotal, Maintenance Costs	\$1,606	\$1,185	\$819
Total OM&R	\$2,200	\$1,779	\$1,413

CURRENT PROJECT USE

This section presents a description of current project use. This is defined in terms for which data are available and covers the authorized purposes of commercial and recreational navigation as well as other recreational and incidental uses such as water supply and hydropower. This section develops the base data against which impacts of alternatives will be compared in a later section of this report.

COMMERCIAL NAVIGATION

Historic Traffic

The historic movement of commodities, as gathered by the Louisville District, Corps of Engineers, and as reported by the Waterborne Commerce Statistics Center, is shown for the 28-year period of 1951 through 1978 in Table 4. Traffic is shown as upbound, downbound, and totals and is presented for three river segments, i.e., Locks 1-4, 5-10, and 11-14. Brief spot movements of aggregate occurred in pools above Lock 5 in 1972-75 and 1967-68. Continuous traffic in the upper pools ceased in 1964.

Approximately 99 percent of the tonnage moved on the Kentucky River since 1964 has been aggregate movements and except for 1967-68, essentially all traffic has been in Pools 1 through 4. Aggregate movements have closely followed major construction projects in the region, primarily highway construction.

TABLE 4
KENTUCKY RIVER WATERBORNE TRAFFIC
SOURCE: Waterborne Commerce Statistical Center (U.S. Army Corps of Engineers)

Year	Recorded Traffic Volumes (Thousands of Tons) *						Total River Volume (Origin or Dest. in Ky. River)
	Locks 1-4		Locks 5-10		Locks 11-14		
	Up	Down	Up	Down	Up	Down	
1951	60.4	-	(UA)	(UA)	(UA)	-	5.1 4/
1952	71.2	-	(UA)	(UA)	(UA)	5.1	19.3
1953	72.1	-	(UA)	(UA)	(UA)	19.3	32.6
1954	99.7	-	(UA)	(UA)	(UA)	32.6	54.7
1955	121.1	.2	40.5	.2	40.7	.9	77.2
1956	128.6	-	36.1	-	36.1	-	77.2
1957	159.1	-	159.1	-	(UA)	-	97.5
1958	231.4	-	231.4	-	(UA)	-	77.2
1959	271.5	-	271.5	-	41.6	-	126.7
1960	232.1	3.0	244.4	-	24.4	-	160.2
1961	245.8	-	245.8	-	-	-	181.7
1962	301.5	.4	301.9	.4	.8	.4	130.7
1963	322.2	-	322.2	-	-	-	95.3
1964	409.4	-	409.4	-	-	-	52.5
1965	318.8	-	318.8	-	-	-	-
1966	401.7	1.2	402.9	-	-	-	-
1967	506.3	2.9	509.2	-	411.0	1/	918.9
1968	454.3	.5	454.8	-	582.7	1/	1,040.0
1969	499.8	-	499.8	-	-	-	499.8
1970	424.4	1.5	425.9	-	-	-	425.9
1971	525.6	.3	525.9	-	-	-	525.9
1972	601.5	-	601.5	-	2.5	-	601.5
1973	773.7	.5	774.2	9.6	10.1	-	652.6
1974	652.6	-	652.6	2.4	2.4	-	652.6
1975	570.8	6.8	577.7	-	6.8	6.8	580.5
1976	538.7	-	538.7	-	-	-	538.7
1977	465.1	-	465.1	-	-	-	465.1
1978	415.5	-	415.5	-	-	-	415.5

NOTES: UA = Data Unavailable
 * Maximum traffic for stated locks; due to uniformity of shipment patterns, this traffic volume usually equal for all locks indicated.
 1/ 1967-68 downbound local aggregate movement; Frankfort destination presumed (major construction projects).
 2/ 1952-69 upbound movements included an average annual shipment of 64.3+ tons petroleum between Ohio River and Frankfort.
 3/ 99% of other upbound movements this period is aggregates, usually destined to Frankfort (origin Ohio River).
 4/ After 1969 over 99% upbound movement is aggregate to Frankfort, Ky. (origin = Ohio River).
 Downbound movement (Pools 11-14) between 1952-64 is all coal -- origin = Bestville, destination = Ford Steam Plant (mile 177.4)

Future Traffic

Although no recent commodity, traffic and rate studies have been conducted specifically for the Upper Kentucky River System, three closely related studies have been completed. Information obtained from these three closely related projective studies, as well as a review of recent contacts by various interests known to have expressed an interest in the possibility of moving commercial tonnages on the Upper Kentucky River, forms the basis of information available on projective data.

In 1977 the Ohio River Division, in cooperation with its four Districts, jointly initiated three independent studies aimed at developing alternative traffic projections for the Ohio River main stem and tributary navigation system. The first of these studies, a statistical correlation and regression analysis, correlated past commodity movements with various independent variables to develop projected movements to the year 1990. Since there was no meaningful recent historical commodity movements on the Upper (Locks 5-14) Kentucky River, the resulting data reflects anticipated traffic on the Lower System, Locks 1-4. The study, conducted by Consad Research Corporation, Pittsburgh, Pennsylvania, indicated an increase in tonnage to 734,000 tons by the year 1990. This data projects sand movements through the lower four locks only.

The second independent projection study was accomplished by the Battelle Memorial Institute, Columbus, Ohio, Laboratory and was developed through a highly structured survey to obtain the views of waterway shippers concerning potential future use. Of the three independent studies, this effort resulted in the most optimistic short-term estimate for the Kentucky River with a projected volume of 914,000 tons by 1990. Again, however, the results reflected anticipated use of the lower four locks for sand movements only.

The third set of projections were developed from a detailed analysis of potential supplies, demands, modal-split characteristics, and the economic and institutional factors affecting production, consumption, and modal choice. The results of this study, conducted by Robert R. Nathan Associates, Washington, D.C., estimated 517,400 annual tons of commerce would move through

the lower four pools of the Kentucky River System by 1990, increasing to 607,000 tons by the year 2040. Results of the study further determined the movements to be sand only.

Permit History (Docks)

In the reach of the Kentucky River between Lock and Dam No. 5 and Lock and Dam No. 11, there are five permitted coal-loading facilities. The oldest of these permits was issued on 25 August 1941. The most recent permit for a coal dock was issued on 5 February 1957. There has been no indication of interest in these facilities since 1957. In the reach of the Kentucky River above Lock and Dam No. 11 (including South Fork), there are four permitted coal-loading facilities. There has been recent action on two of these facilities. An authorization was given on 12 November 1974 to modify an existing facility in Pool No. 13. This permit was subsequently transferred to another company on 10 January 1979. The next most recent action was in 1978. Some site preparation work was found during a routine inspection at a location in Pool No. 14 for a permit issued in 1952. The last actual permit authorized in the upper reach was issued in 1954. The permit files do not reflect the handling capabilities of these facilities relative to quantities, delivery systems to the site, or destinations for the loaded barges. An inspection of facilities made in October 1980, which did not reveal continued maintenance or use of the facilities, combined with the fact that no traffic has occurred, indicates the permits would not be valid at this time.

Hours of Operation

A number of local people believe that declining use of the Kentucky River locks by commercial and recreational crafts was the result of the reduced hours of operation for the locks. Figure 3 shows the number of recreational craft lockages per year over the period 1970 to 1979. A comparison between the hours of operation in 1968 with hours of operation in 1979-80 shows that, while hours of operation have been reduced 55 percent, the number of lockages has declined 76 percent. For information purposes the hours of operation for the Kentucky River Navigation project are shown in Table 5.

KENTUCKY RIVER LOCKS 5 - 14

LOCKING OF PLEASURE CRAFT X 1000

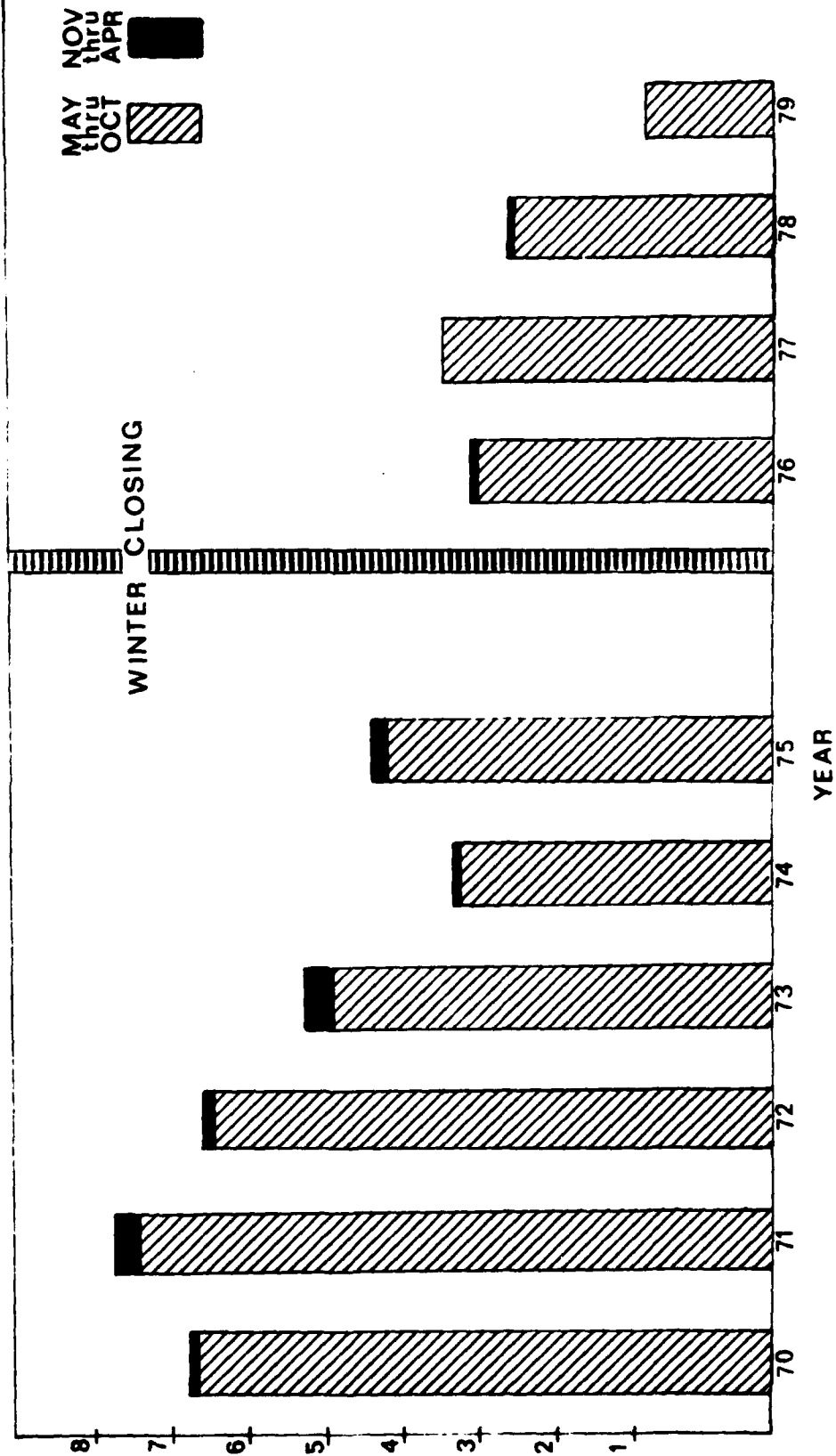


TABLE 5
CURRENT
OPERATION SCHEDULE

Time of Operation	1980
Locks 1-4	
Months	12 mos/yr
Days	7 days/wk
Hours	7 AM - 11 PM
Locks 5-10	
Months	May - Oct 1/
Days	Fri-Sun Mon-Thur
Hours	8AM - 8PM 12 - 8PM
Locks 11-14	
Months	May - Oct 1/
Days	Thurs-Mon Tues-Wed
Hours	12 - 8PM Closed

1/ Locks closed November through April.

Since 1968 the hours of operation have changed a number of times. The procedure prior to issuing a notice to navigation interests is to review changes in recent years data, which has generally reflected declining use, irrespective of closures due to repair and maintenance or catastrophic weather conditions; to then review data and proposed changes with lock personnel. Only after review of such cause and effect relationships and analysis of potential impacts is a new schedule of operation implemented.

PROJECT RECREATIONAL VISITATION, RECREATIONAL BOATING, AND SMALL BOAT NAVIGATION

Historically the Kentucky River Navigation Project has provided limited water-oriented recreation opportunities for visitors to the river basin. Statistically the largest recreation use to the project area has been by sightseers, boaters, and fishermen. Table 6 provides recent sightseeing visitation to Locks and Dams Nos. 5 through 14.

TABLE 6

ANNUAL VISITORS
LOCKS AND DAMS 5 THROUGH 14

Year	Sightseers
1975	181,800
1976	169,900
1977	156,500
1978	216,600
1979	168,000

A main consideration for recreation visits to the Kentucky River is the availability of facilities for ingress to and egress from the river. Table 7 below summarizes the known boat ramps between Beattyville and Frankfort, Kentucky.

TABLE 7

KENTUCKY RIVER BOAT RAMPS

Location	Pool	Lanes	Condition	Public/ Private	Launches/ Week
Beattyville	14	1	Good	X	85
Irvine	11	1	Good	X	85
Ft. Boonesboro	9	2	Good	X	335
Richardson's Marina (Richmond)	10	1	Good	X	50
Captains Quarter (Clays Ferry)	9	1	Good	X	40
Kelly's Marina (Clays Ferry)	9	1	Good	X	170
Valley View	9	1	Good	X	55
Camp Nelson	7	1	Fair	X	75
High Bridge	7	1	Fair	X	40
Craigs Creek (Frankfort)	4	1	Good	X	55
Shore Access (Frankfort)	4	1	Good	X	55
Frankfort City Ramp	4	2	Fair	X	335
Lee's Marina (Frankfort)	4	1	Good	X	40
Total Launches/Week:					<u>1,390</u>

Application of basic standards to weekly boat launches within the Beattyville-to-Frankfort area results in the following estimate of project use in the pool areas by boaters using ramps and who do not permanently or seasonally moor their boats at marina facilities.

$$A = W \times N \div 0.7 \times 2.5$$

where: A = annual visitation

W = weekly launches

N = number of weeks in recreation season

Assume 70% of visitation occurs during recreation season

Assume 2.5 persons/boat

$$A = 1,390 \times 25 \div 0.7 \times 2.5 = 124,108$$

A survey of the Kentucky River above Frankfort to Beattyville showed there to be nine major commercial dock and marina facilities in operation containing nearly 300 slips. This analysis adds those project users who permanently or seasonally use available mooring facilities.

300 boats moored on Kentucky River

Based on interviews, approximately 90% of boats,

or 270 boats, are used each weekend

Assume 40% area utilization during weekdays

$$A = 300 \times 0.9 \div 0.7 \times 2.5 \div 0.6 \times 25 = 40,179$$

Total estimated project use by the boating public is therefore obtained by the summation of the above data.

124,108

40,179

164,287 Boater visitation

Assume 10% of use from outside market area

164,287/0.9 = 182,542

Say 185,000 visitors in 1979.

Table 8 is an estimate of boaters to the project area and the number of pleasure craft locked through Kentucky River Locks 5 through 14 for 1974 through 1979.

TABLE 8
PLEASURE CRAFT LOCKAGES
LOCKS 5 THROUGH 14

Year	Boaters	Lockages
1974	440,000	3,667
1975	535,000	4,428
1976	415,000	3,446
1977	420,000	3,487
1978	365,000	3,044
1979	185,000	1,543

As can be seen from Table 8, use of the system has dropped severely within the last three years. Several factors are believed to have helped cause the reduction in recreation use. Reduced long distance recreational boat travel is partially attributable to recent recessionary times. Lock No. 11 was closed during the entire 1977 recreation season. In 1978 and 1979, Lock 11 was closed into the month of August for both years.

The flood of December 1978 severely damaged or destroyed many dock and marina developments along the river. Considerable rebuilding of these facilities has occurred in certain sections of the river while in other sections there has been little or no rebuilding. The span of river between Frankfort and Clays Ferry (Locks and Dams 5 through 10) has been especially slow in rebuilding and at this time is practically void of dock facilities, causing problems for boaters in obtaining necessary supplies and fuel to navigate this portion of the river.

The majority of the dock and marina operations are located in the general vicinity of the Fort Boonesboro State Park. In the Lock 9 pool alone, there are five docks with all offering slip rentals and most supplying fuel and miscellaneous supplies. The state park is one the largest tourist centers in

the Kentucky River Basin. Facilities at the park include a rehabilitated fort, beach, bathhouse, restaurant, gift shop, boat dock, excursion boat, and camping facilities. The excursion boat, DIXIE BELL (see Figure 4), has been one of the major attractions at the park.

Upstream from Boonesboro, dock and marina facilities are sparsely located with only two major operators above Lock 10. The largest facility is located in the Irvine-Ravenna vicinity with no other major facility in operation upstream.

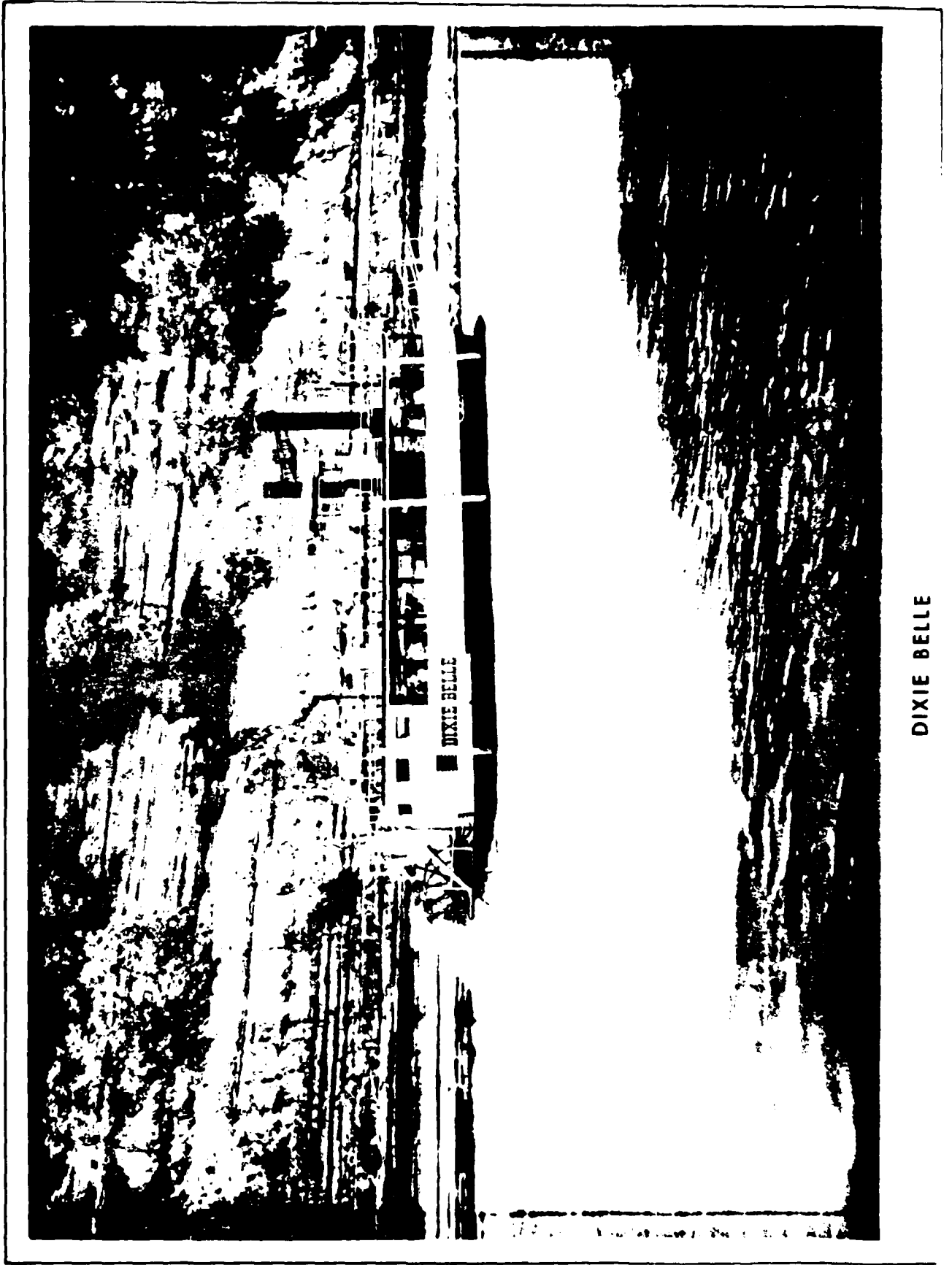
Interviews were recently held with marina operators along the pool reach to determine recent recreation business trends. Most operators indicated their businesses to be down over the past several years by about fifty percent with some quoting even higher business loss figures.

It was the general concensus that if gasoline prices stabilized and more facilities developed in the area between Frankfort and Boonesborough, and if the locks and dams were kept in working order that recreation river traffic will increase.

Indications are that if the navigation system is kept operational under the current status, dock and marina development could occur in the vicinity of High Bridge, Brooklyn, and the Dix River.

Assuming normal operational status under condition that existed prior to Lock No. 11 closing for repairs in 1977 and the flood of 1978, boating use for 1985 is projected to be 438,800. Sightseers are expected to increase to approximately 193,800 visitors by 1985.

Table 9 shows total number of visitors to the project area, projected to the year 1985, assuming normal economic and recreational conditions.



DIXIE BELLE

TABLE 9

TOTAL PROJECT VISITATION ESTIMATE
LOCKS AND DAMS 5 THROUGH 14

Year	1975	1980	1981	1982	1983	1984	1985
Boaters	535,000	425,000	424,100	424,900	424,600	432,200	438,800
Sight-seers	<u>181,800</u>	<u>184,300</u>	<u>186,200</u>	<u>188,100</u>	<u>190,000</u>	<u>191,900</u>	<u>193,800</u>
Total	716,000	609,300	610,300	613,000	617,600	624,100	632,600

Because of problems discussed above, boating activities have been centered around specific areas, leaving much of the river underutilized. With the increase in boating that is expected, a better distribution of user density can also be expected to occur throughout the project reach.

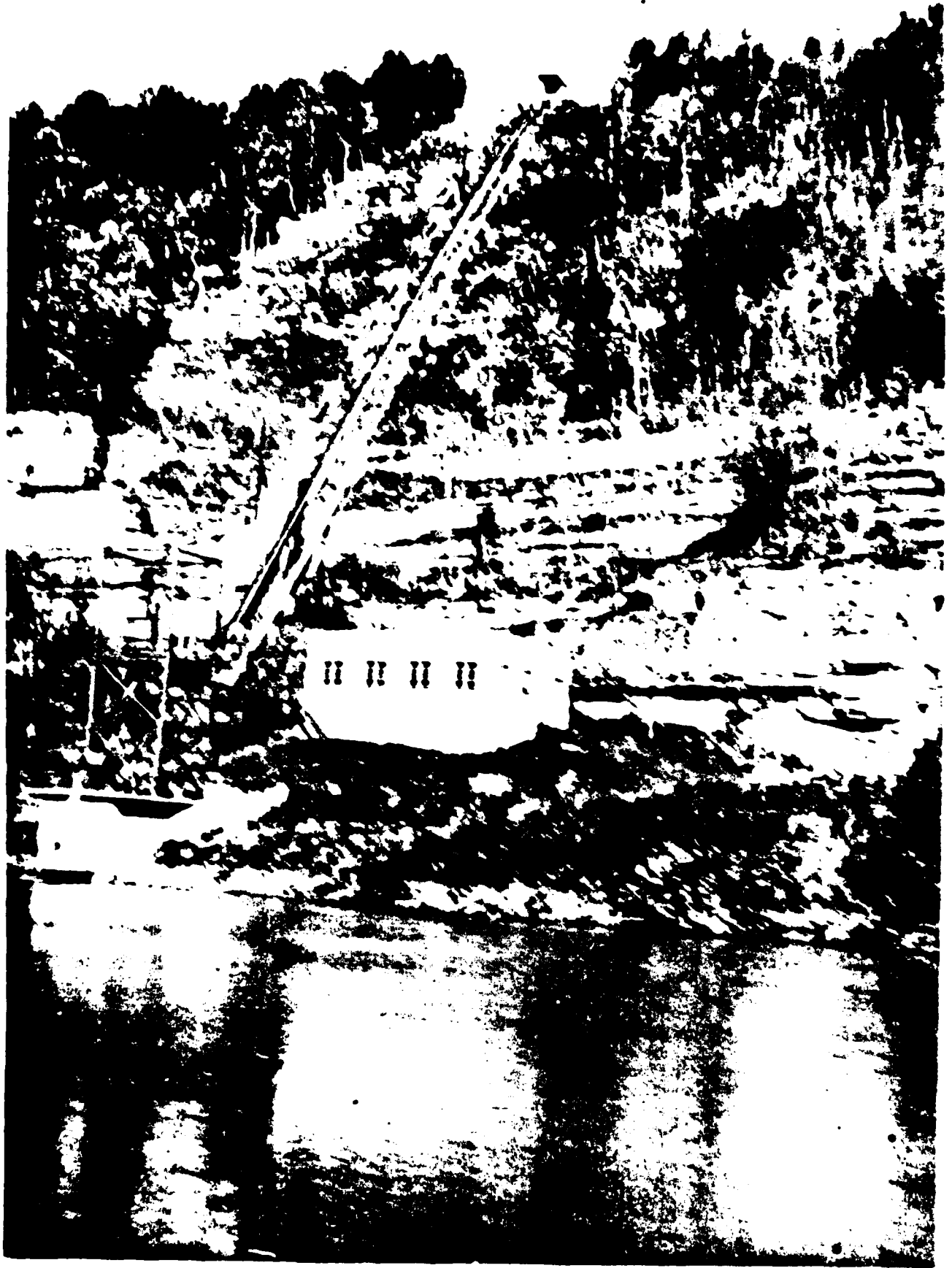
WATER SUPPLY

Through the years, with the decline of both commercial and recreational navigation, water supply has become one of the most important functions of the Kentucky River navigation pools. This function is made more feasible with the system of Locks and Dams in place, creating a series of 14 pools from which to draw water for both communities and industry. These principal users of the Kentucky for water supply are shown on Figure 5.

Historical and Existing Use

Surface water is the primary source of municipal and industrial water used in the basin. Historically many communities constructed reservoirs to provide surface storage for year-round supplies. However, as population and water needs grew, the impoundments became inadequate and lines to the Kentucky River were constructed for additional supplies. Presently, the slackwater pools of the Kentucky River are the principal water supply source for 13

municipal/rural users and some 13 self-supplied industries currently withdrawing 100,000 gallons per day (gpd) with 18 of these located in Pool 5 or above. The largest municipal user is Kentucky-American Water Company (see Figure 6) which supplies Lexington and six rural water services. Average 1979 withdrawal was 26.7 mgd from Pool 9. Table 10 shows average withdrawal from the 13 municipal/rural users and the largest industrial users.



KENTUCKY RIVER WATER INTAKE-POOL 9

TABLE 10

WATER SUPPLY DATA

City/Industry/ System Name (Pool)	System Capacity (MGD)	Existing (MGD)		Projected Demand (MGD) 1/				1979 Population Served (1,000)
		Average Production 1975 1/ 1979 2/	Average Production 1979 2/	1980	2000	2030		
Clay City (10)	0.36	0.15	0.19	0.128	0.138	0.125	1.6	
Frankfort (4)	18.00	5.07	6.53	5.29	6.74	7.70	30.3	
Harrodsburg (7)	2.00	1.45	1.52	1.72	1.99	1.83	10.8	
Lancaster (8)	1.44	0.49	0.63	0.37	0.33	0.29	2.9	
Lawrenceberg (5)	2.26	0.96	1.20	1.11	1.42	1.64	6.9	
Lexington (9)	48.00	26.87	31.76	30.62	40.32	48.51	205.5	
Nicholasville (8)	3.60	0.97	1.47	1.35	2.67	3.66	13.4	
Owenton (2)	0.75	0.42	N/A	0.27	0.25	0.20	2.0	
Richmond (11)	0.70	2.78	4.14	2.97	4.19	4.27	17.6	
Stanton (10)	0.72	0.19	0.41	0.21	0.25	0.23	2.8	
Versailles	2.85	1.13	1.67	1.14	1.42	1.37	8.6	
Wilmore	0.42	0.33	0.38	0.45	0.86	1.88	2.9	
Winchester	5.50	1.77	2.42	2.27	3.02	2.89	18.2	
WC Dale Steam Plt.	76.00	-	-	-	-	-	-	
EW Brown Steam Plt.	72.00	-	-	-	-	-	-	
Tyrone Steam Plt.	187.70	-	-	-	-	-	-	
Kentucky Stone Co. (5)	-	-	-	-	-	-	-	
Asbury College (6)	-	-	-	-	-	-	-	
KY Distilling Co. (7)	-	-	-	-	-	-	-	
Southeast Coal (11)	-	-	-	-	-	-	-	
Irvine-Ravenna Municipal (11)	-	-	-	-	-	-	-	
Beattyville (14)	-	-	-	-	-	-	-	

1/ Special Report - Water Supply Alternatives to Red River Lake - U.S. Army Engineer District, Louisville, Kentucky, 1978

2/ "Bluegrass Advantage" - May 1980; Vol. 5, #5.

Local Interests and Desires

In a recent paper ballot by the Bluegrass Area Development District Executive Board, water supply adequacy was ranked as the number two need of the area (it was headed only by need for additional manufacturing jobs). Also, at a public meeting held in Lexington, Kentucky, 26 June 1980, nearly 500 people attended to protest the proposed closing of Locks and Dams 5 through 14 on the Kentucky River. The general feeling was that if the locks were closed and the system no longer maintained, the slackwater pools would be lost and water supplies would be impaired. Pertaining to water supply, these concerns most accurately reflect both regional and local interests and desires for some 324,000 persons served by the water systems represented.

Existing Demands and Projections

Rapid development and growth of the metropolitan Lexington area and continuing growth of the numerous other communities in the Kentucky Basin has increased the demand for adequate water supply, both now and in the future. Table 10 shows existing demand and projections for the future.

Although not an authorized project purpose and therefore classified as "incidental," water supply benefits accrue to the Kentucky River navigation project. The existence of a system of navigation pools and the storage space therein, produces measurable water supply benefits. This conclusion resulted from the extensive water supply analysis accomplished in the "Special Report, Water Supply Alternatives to Red River Lake." In brief, this report concluded that under certain drought conditions, i.e., (1) recurrence of the 1930 drought (approximate 100-year frequency), (2) demand projections based on Office of Business Economics population projections, and (3) without non-structural conservation measures that shortages would result. Alternative costs were dependent on the ability to draw down the Kentucky River navigation pools below that level required to maintain the authorized 6-foot project depth. A 2-1/2-foot allowable drawdown, which would maintain recreation navigation and critical environmental parameters, was tested in developing alternative water supply costs.

The resulting analysis showed that without the 2-1/2-foot drawdown of pools, an additional 30,200 acre-feet of storage space would be required at a least alternative cost of \$9.6 million (single purpose water supply reservoirs on Station Camp Creek and Muddy Creek). By utilizing the 2-1/2-foot drawdown of the Kentucky River navigation pools, incremental storage requirements were reduced to 23,900 acre-feet at a cost of \$7.6 million (Station Camp Creek site only). The increment in cost, i.e., with and without utilization of storage space resulting from the navigation project, updated to current values and using a 7-3/8 percent discount rate, provides the following measure of incidental water supply benefits (Table 11).

TABLE 11
 COMPUTATION OF INCIDENTAL
 WATER SUPPLY BENEFITS
 CREDITABLE TO POOL MAINTENANCE

Item	Without Navigation Project Storage (\$1,000,000)	With Navigation Project Storage (\$1,000,000)
Least Cost Alternative Project	Station Camp and Muddy Creek Reservoirs	Station Camp Reservoir
First Construction Cost	<u>8.5</u>	<u>6.5</u>
March 1977 Price Level	12.3	9.3
Interest During Construction	<u>1.8</u>	<u>1.4</u>
Investment Cost	<u>14.1</u>	<u>10.7</u>
Annual Interest & Amortization	1.07	0.81
O&M	<u>.15</u>	<u>.10</u>
Total Annual Cost	1.22	0.91
Water Supply Benefits = (1.22 - 0.91) = \$0.31 M		

HYDROPOWER

Although only one hydropower plant is located on the Kentucky River at Dam No. 7 (Figure 7), reconnaissance level small scale hydropower feasibility study results (recently completed) at Dam No. 4 were favorable and further detailed studies are programmed as a part of the Kentucky River and Tributary Survey Study. Although hydropower is not an authorized project purpose for the Kentucky River navigation project, incidental power benefits accrue to the project.

The unit in operation at Lock and Dam No. 7 is owned by Kentucky Utilities and was placed in operation in 1927-28. Pertinent information and the computation of incidental hydropower benefits is provided as follows.

Installed Capacity: 3 units at .85 MW/ea = 2.55 MW

Dependable Capacity = 0

Average Annual Energy = 5.0 GWh

Estimated Plant Factor = 30%

Utilizing July 1980 escalated values, combustion turbine:

Dependable Capacity = 0

Intermittent Capacity Benefit = $(2.55 \text{ MW} - 0)(\$26.00)(0.5) = \$33,150$

Energy Benefit

$[5.0 (10)^6 \text{ kwh}] [\$48 (10)^{-3}/\text{kwh}] = \$240,000$

Total Benefit = Energy + Capacity = \$273,000

Less OM&R Costs = - 15,000

Net Benefit = \$258,000

Rounded = \$260,000

The cessation of locking, at Dam No. 7 would make a very small amount of additional power available.

FLOOD CONTROL

Although the public generally perceives that the Kentucky River Navigation Locks and Dams projects have flood control capability; that is not the case.



KENTUCKY RIVER LOCK & DAM 7

Flood control is not an authorized purpose nor do incidental flood control benefits accrue to the projects. There is no flood storage in pools behind the dams on the Kentucky River. When the river rises to levels approaching the damage stage, the dams are completely submerged and the high water profile is essentially the same as would have occurred had the dams not been in place.

A second public perception was the expressed concern that the cessation of dredging would allow the river to fill up with silt and thereby lose flood control storage space. This concern is dispelled by the fact that dredged material is simply moved out of the navigation channel and redeposited outside the channel but still in the river, thereby not affecting the river channel capacity.

ENVIRONMENTAL CONSIDERATIONS

Existing Environmental Setting

A description of the existing physical, biological, and socioeconomic elements of the project area is presented in the Final Environmental Impact Statement (EIS), Operation and Maintenance, Kentucky River Navigation Project which was filed in March 1976.

Environmental Effects of the Present Project

The environmental impacts of the continued operation and maintenance of the existing navigation system are presented in the EIS and the primary effects are summarized below.

The original construction of the navigation system converted a free flowing river into what is now essentially a series of shallow interconnected lakes-- except during flood conditions. This resulted in the creation of much wetland and in a major faunistic change from those animals requiring shallow flowing water to those which favor a deeper slackwater environment. Because of the long-standing nature of the present system, it is in equilibrium with

the vast majority of its environmental elements. Much of the present aquatic fauna is composed of lake-dwelling species which adapt well to the pools of the present system; such organisms would be at a disadvantage in a totally riverine environment.

As a result of the development of an ecology which is dependent on a slackwater environment, no long-term impacts are anticipated from the continued operation and maintenance of the present navigation system unless commercial traffic should substantially increase in the future--an event which is not considered probable. Short-term impacts are primarily related to maintenance dredging operations which result in temporary and localized impacts at the dredging and disposal sites. These impacts include temporary degradation of water quality with the attendant disruption or destruction of local aquatic life. Physical disruption and turbidity at these sites will drive fishes away temporarily and will displace or bury some benthic fauna. Although some organisms will be destroyed, the spoil will provide a new substrate on which recolonization by benthic plants and animals should soon follow the disposal operations. The effects of dredging operations on spawning are minimal. The primary limiting factor on spawning in the Kentucky River is the naturally occurring turbidity. Fish movement between pools is not seen to be greatly restricted by the present system. Upstream migration of most species coincide with high spring water when the dams represent only minor barriers.

Areas of Special Concern

During the course of the public involvement process, two general areas of special concern were identified for the Kentucky River: (1) historical values, and (2) natural and scenic values.

Historical Features

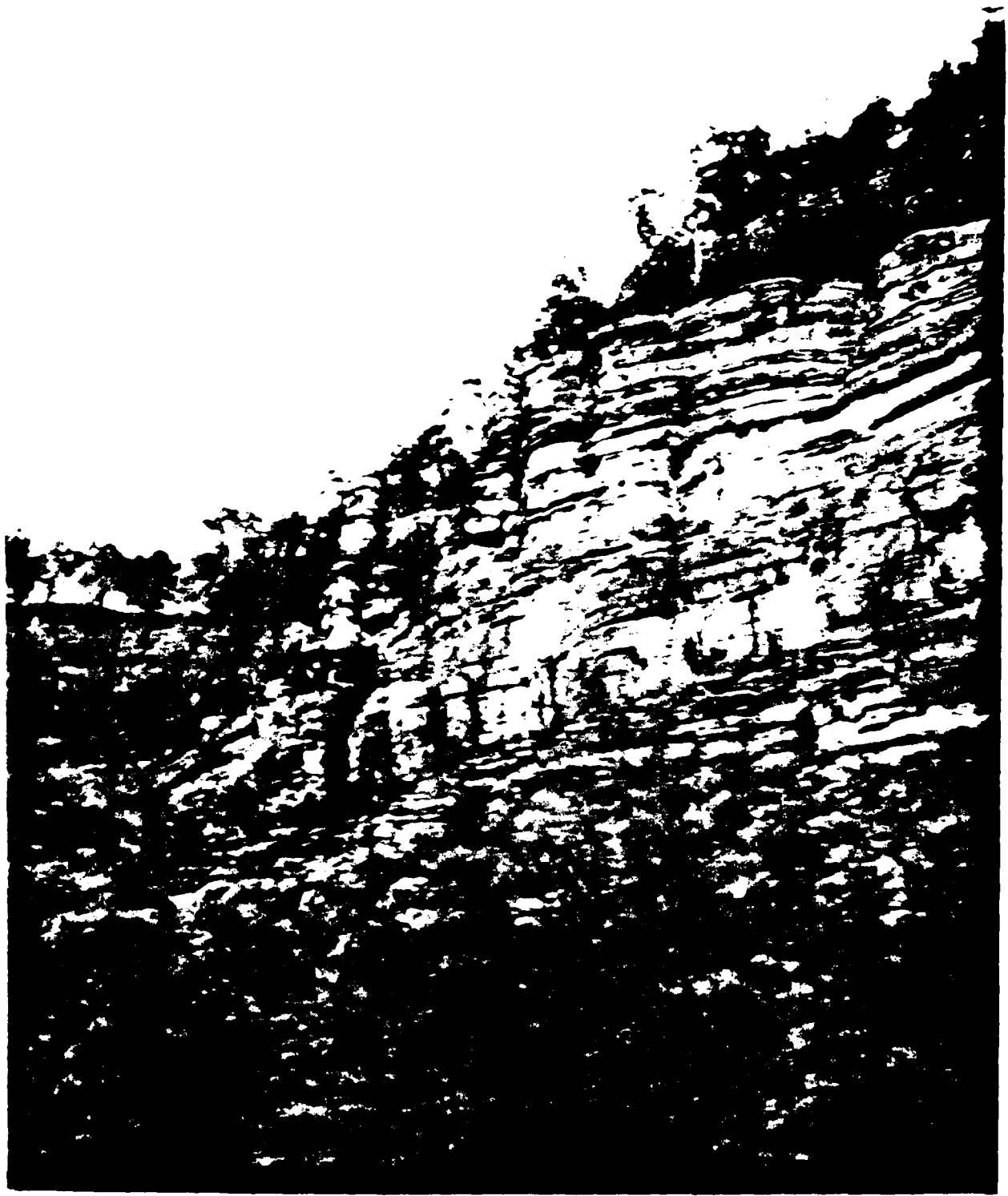
The Kentucky River Basin has a rich and colorful history, much of which is directly associated with the river. The Kentucky River Navigation System

is an integral part of this history and the locks and dams themselves represent a cultural resource. The history behind the development of these structures has previously been described. The utilization of these structures by pleasure craft provides an opportunity to experience the function of a system that played a significant role in the development of the Kentucky River Basin and helps to give an appreciation for the value that waterborne commerce had in the early development of the state.

Natural and Scenic Features

The Kentucky River has been characterized by some as one of the most scenic rivers in the state. The most scenic section is a stretch known as the "palisades" (see Figure 8). This is the segment of the river which has banks of limestone cliffs formed by the erosion of the Cincinnati anticline near its apex. Extending from a point above Frankfort to Camp Nelson at Hickman Creek, Jessamine County, the highbridge limestone, the oldest formation in Kentucky, forms the walls of the river gorge. This is a very resistant cliff-making rock and here the gorge is generally only a little wider than the stream. The high steep cliffs, narrow winding river valley, and various soil types in the palisades area all contribute to provide a wide variety of habitats which support a diversity of plant communities as well as many individual species that are rare or unusual. Not only is there a rich collection of common species of flora, but a number of relict species occur. The plant communities within the palisades are not at all representative of the vegetation in the remainder of the Bluegrass Region in which it lies. The scenic qualities of this area together with its unusual vegetational characteristics set it apart from the rest of the river.

The palisades are basically located on Pools 5 through 8. Public boat ramps are limited on these pools with Pool 6 having no public access at all. As the palisades area is easily accessible only by river, closing of the locks would have the effect of limiting access to this scenic natural area to small craft that could be portaged over the dams.



KENTUCKY RIVER PALISADES

PUBLIC INVOLVEMENT

The public involvement process utilized in development of this study and its conclusions and recommendations, along with a summary of concerns and perceptions is presented in this section. Although response to concerns is contained in other sections of this report, such response is summarized in this section in order to define and emphasize public desires and interest.

On 1 April 1980, the Louisville District issued a Public Notice advising that an evaluation has been initiated to determine if locking operations at Locks 5 through 14 on the Kentucky River should be discontinued at the end of the 1980 recreation season (1 November 1980). The notice was mailed to Congressional, Federal, State, and local interests including the news media. In all, some 2,200 notices were mailed so as to provide a broad distribution to known concerned interests. The Public Notice defined the proposed action, described the decision process, and requested public comment. The notice further explained that the decision on whether to hold a public meeting would be conditional upon the public response during the ensuing 30-day review period.

In total, 150 separate pieces of correspondence were received in response to the initial Public Notice and prior to the public meeting. In summary, the public response was nearly unanimous in objecting to the suspended lock operation proposal with a large contingent requesting that a public meeting be held. The public response to the initial Public Notice is contained in Section A, Volume II of this report.

On 19 May 1980, approximately 2,300 announcements of the public meeting were mailed to Congressional, Federal, State, and local interests, including the news media. The public meeting held in Lexington, Kentucky, on 26 June 1980 began at 8:00 p.m. and closed at midnight. Registered attendance was 420, with estimated actual attendance of 480. All 31 speakers or persons who provided statements opposed the proposed action to suspend locking operations at Locks 5 through 14. The record of the public meeting is contained in Volume II, Section B of this report.

The following is a summary of concerns expressed in correspondence and verbally, before, during, and after the public meeting.

Concerns were expressed that the suspension of locking operations at Locks 5 through 14 would:

a. Result in the termination of dredging, thereby allowing the river to silt up and increase flooding as well as decrease water supply potential of the project.

b. Result in decreased maintenance of locks and dams and therefore, increase the likelihood of structural failure, loss of pools, and loss of water supply.

c. Adversely impact water quality.

d. Adversely affect the demand and transportation cost of coal which is in abundant supply in eastern Kentucky.

e. Adversely affect recreation, tourism, and commercial recreation businesses along the Kentucky River and in the region including Boonesboro State Park and other facilities.

f. Result in increased safety hazards to boaters who rely on obtaining weather and river forecast information from lock and dam personnel as they lock at various points along the Kentucky River.

g. Result in increased safety hazards to residents, boaters, campers, and others because source of information on rainfall, runoff, and flood stages provided by lock and dam personnel to the U. S. Weather Service would be impaired as well as the direct flow of information during disasters from lock and dam personnel to the public.

h. Result in reduced dependability of water supply or potential for water transportation of coal which could alter decision by utility companies on future plant location, thereby resulting in loss of income and employment opportunity to the region. Further concern was expressed that increased likelihood of structural failures could add costs for water supply intake design and construction by \$2 to \$10 million for one or two facilities.

1. Severely impair the opportunity for people, regionally and nationally, to see and experience the unique historical and environmental features of the Kentucky River.

These expressed concerns, be they real or imagined, reflect the love, emotional dependence, and concern that people have for the Kentucky River as it has existed for over the last 100 years.

Response to these expressed concerns are provided throughout their report under appropriate topics.

In addition to concerns and comments provided by the public regarding the proposed action to suspend lock operations at Locks 5 through 14, specific alternatives or compromise plans were requested. Letters also requested alternative methods of financing the operation and maintenance costs of the Kentucky River. These alternatives are considered and evaluated in the following sections of this report. Selected examples of newspaper articles which covered the period of the initial proposal to cease locking through the public meeting are presented in Figures 9, 10, and 11. Additional articles are presented in Volume II, Public Involvement Appendix.

APR 4 - 1980

Army wants to stop operating most locks on Kentucky River

By MARILYN BAILEY
Leader state editor

The Army Corps of Engineers has given notice that it may suspend locking operations on the Kentucky River from Locks 5 through 14 after the 1980 boating season.

This would involve about a 170-mile stretch from Lock 5, located near Lawrenceburg to Lock 14 at Heidelberg in Lee County near Beattyville.

The corps also intends to discontinue maintenance dredging above Lock 4 at Frankfort.

It is the corps' contention that navigational use of the Kentucky River has shown a gradual decline over the last several years. According to corps information lockage of recreational boats has declined over the past 10 years from 12,400 in 1970 to 3,290 in 1979.

The corps states that because locks 5 through 14 are not being used for commercial navigation and are receiving only limited and declining use by recreational craft these structures are presently being operated only during the recreation season (May through October.)

During the past several years the Louisville District has been reviewing Kentucky River locking records and comparing lock utilization with operation and maintenance costs for these facilities. As a result of the reviews the corps feels that the continued operation of the Kentucky River navigation system above Frankfort is not economically justified.

It is the corps plan that these locks will not reopen in May 1981.

The closing of the locks is considered an interim action pending a recommendation to Congress on the permanent disposition of these structures.

This would mean, for example, if a boater puts in at the Clays Ferry

boat dock in Madison County he would only be able to travel on the river between Locks 9 and 10 which are located at Valley View and Ford.

According to Bill Meade, fleet captain of the Lexington Yacht Club, this will create a bad situation for pleasure boaters.

"I hate to see this personally," said Meade. "But I can understand it financially. It just isn't economically feasible to keep the locks open with the decline in boating on the river."

"I would hope a compromise might be reached whereby the locks could be opened at least a couple of times on the weekends. With the creation of so many new lakes in Kentucky boating on the river has declined, but I still think the Kentucky River has some of the most beautiful scenery around."

"I think it's a real shame," says Mary Gail Birk, whose home is on the Kentucky River near Clays Ferry.

"Unlike any of the lakes in Kentucky, theoretically you can go anywhere in the world from any point on the Kentucky River. My father took his boat from here and sailed to Florida one year," Mrs. Birk said.

"I think they should keep them open at certain times such as one day of the week or weekends. I'd be willing to pay a toll of some sort to use the locks," she says.

Mrs. Birk, a resident of the river area since 1971, said she is also concerned that the locks might be abandoned. "We've always counted on the lockmasters to give us information when the river is flooding," Mrs. Birk's home was heavily damaged during the flood of December 1978.

According to William Pollard, executive assistant to the corps district engineer in Louisville, the locks will not be abandoned. "There will be caretakers to maintain the gauges and such," he said.

Pollard also said that all the lockmasters will be given another job. "There won't be anybody out of a job, if they are willing to relocate," said Pollard.

Allen Greene, lockmaster of Lock 7 at High Bridge, has worked there since July 1978, but has 23 years service in the Corps of Engineers. "It's all a little unnerving, but I can see their point. The operation really isn't paying off... it's a losing proposition."

Greene says that since commercial traffic on the river has declined money allocated for the operation of the locks has also declined.

"Most of the money goes to the Ohio River. It's understandable that they'll spend the money where it will benefit the most people, but it's a little hard to take sometimes."

Greene says he thinks part of the reason for the decline in boating traffic in the areas between Locks 5-14 is the inability of the boater to get gas.

"After the flood of '78 a lot of the boat docks were destroyed and many of them couldn't afford to rebuild. Now the only place to get gas after leaving Frankfort, is the Boonesboro area."

Charlie Ballman, lockmaster at Lock 9 at Valley View says another reason for decreased boating through the lock is the decrease in the hours the locks are allowed to remain open. "Ten years ago, we were open more hours than we are now. That's bound to have a dampening effect," he said.

Ballman, who has been at Lock 9 for about 11 years, also says he thinks the closing of the locks will have an adverse effect on the communities whose water systems depend upon the Kentucky River.

"If they discontinue dredging operations, how long is it going to be before this river fills up? I'm not saying it will happen tomorrow, but it will happen."

Ballman says that if there is no locking of boats there's going to be a lot of stagnant water and costs of purifying water will be more expensive.

Written statements concerning the closing of the locks are requested by Col. Thomas P. Nack, corps district engineer, at P.O. Box 59, Louisville, 40201. Statements will be received until May 1. A 30-day review period will follow and a public hearing may be held if Col. Nack determines that it is necessary.

"The doors aren't closed," said Pollard. "If there is sufficient interest and we can justify keeping them open we will. If people aren't interested, the locks would have to be closed."

FIGURE 9

Woodford Co. Sun
VERSAILLES, KY.
Circulation: 3,257

JUL 3 1980

Government officials, citizens protest lock closing proposal

More than 400 persons attended the U.S. Army Corps of Engineers' public hearing on the proposed closing of locking operations on the Kentucky River last Thursday night.

All speakers objected to the corps plan, which calls for a shutdown of operations at locks five through 14. The corps maintains decreased recreational and commercial water traffic no longer justifies the expense of maintaining the locks.

Most speakers expressed concerns for the effect closing the locks would have on water supplies from Beattyville to Frankfort and for the loss of flood monitoring control on the river.

Versailles is among many towns which depends on the pooling capacity created by the lock system. Others which would be affected by the lock closing are Lexington, Irvine, Richmond, Nicholasville, Lawrenceburg, and Frankfort.

Don Mills, chief administrative aide to Gov. John Y. Brown Jr., told the gathering that the Brown administration "strongly opposes" the plan.

Mills said the state considers the proposal a "stopgap" that would limit the state's options concerning water quality, water supplies, energy production, and recreation.

Col. Thomas P. Nack, district engineer

of the Louisville district office, said the proposed closing on the locks on Nov. 1 would be an interim measure until the results of a Kentucky River and Tributary Study are known. That study is slated for completion by 1984.

Several state and local government officials questioned the ideas that the corps would consider closing the locks before a study is finished.

"It looks like someone is trying to make a decision before the evidence in the case is in," stated Robert Martin, state senator from the 22nd District.

Corps' Lock Plan Spawns Flood of Protest

By Jim Warren
Of The Herald Staff

A tidal wave of protest was launched in Lexington Thursday night against the U.S. Army Corps of Engineers' proposal to close 10 locks along the Kentucky River.

Those speaking against the plan included representatives of Gov. John Y. Brown Jr. and the state of Kentucky, U.S. Sens. Wendell Ford and Walter Huddleston, and Congressmen Larry Hopkins and Tim Lee Carter, as well as other elected officials, businessmen, sportsmen and environmentalists.

The splash of protest came at a public hearing, attended by more than 400 people, which the corps called to receive public comment on its proposal.

The plan calls for closing locks 5 through 14, which stretch from near Lawrenceburg to Beattyville, by Nov. 1.

Corps officials said the locks are not being used for commercial navigation, which was the original purpose for their construction, and the number of recreational boats using the locks has steeply declined. The cost of keeping the locks open is not justified, they said.

The plan to close the locks is a temporary move until the corps completes a Kentucky River tributary study that is expected to recommend the ultimate disposition of the lock system. However, that study won't be finished until 1984.

The fact that the corps is proposing to close the locks before that study is completed drew much of the fire.

Generally, opponents charged that the closing would have adverse effects in these areas:

✓ **River traffic.** Closing the locks, they said, will restrict recreational boating and forever close the river to the possible transportation of coal from Eastern Kentucky fields.

Several opponents claimed the corps' figures, showing reduced traffic, are the result of the corps' own reductions in lock operations and recent heavy floods that destroyed boats and docking facilities.

✓ **Water quality.** With the locks closed, opponents said, the river will flow more slowly, which could cause a buildup in effluents from municipalities along the stream. It also was charged that halting dredging operations will mean a buildup of silt in the river.

✓ **Water supplies.** Robert Eden, vice president of the Kentucky American Water Co., said that closing the locks will not harm the company's ability to draw water for Lexington. But others charged that the water shortages could result with the locks closed.

Don Mills, chief administrative aide to Gov. Brown, said the state considers the proposal a "stopgap" that would limit the state's options concerning water quality, water supplies, energy production and recreation.

Mills said the Brown administration "strongly opposes" the plan.

"We feel overall that the arguments (for closing the locks) are short-sighted . . . when compared with the long-term considerations," he said. "We regard the proposal

premature and extremely unwise."

Mills said various state agencies have reviewed the corps' proposal and have expressed fears that it could affect water quality by slowing the flow of the river, threaten water supplies to Lexington and other cities, and cause the river banks to crumble, increasing the threat of flooding.

House Speaker William Kenton, D-Lexington, asserted that the plan could threaten the "very quality of life" in Central Kentucky, and he noted that the Kentucky General Assembly earlier this year adopted res-

olutions urging the corps to upgrade the lock system.

"We don't want to be had. We want to be helped," said Kenton.

Judge-Executive Ralph McClanahan of Estill County charged that the public hearing was a "farce" and alleged that the corps plans to proceed with closing the locks regardless of comments at the hearing.

Results from the hearing will be considered by the corps' Louisville District office in forwarding its recommendations on the plan to Washington.



Ralph McClanahan

FIGURE 11

ALTERNATIVES

INITIAL SCREENING

This section presents alternative management measures for meeting the objectives of this study and evaluation. The objective, as defined in previous sections, is to reduce operating costs on that portion of the existing navigation system (Lock and Dam Nos. 5 through 14 on the Kentucky River) which is not operating efficiently in meeting the needs for which it was authorized. The period of evaluation is defined as a 5-year period extending from Fiscal Year (FY) 1981 through FY 1985.

The alternative management measures considered include: Plan 1, which is continued operation and maintenance of the system as it is currently operated; and Plan 2, the initial proposed action to suspend locking operations at Locks 5 through 14. Plan 1 is that plan against which all alternates are compared. Other alternatives included in this evaluation are those which arose during the public involvement process. They include Plans 3 through 6 which evaluate a locking by appointment alternative and combination of Plans 1 through 3.

In this section, each alternative is defined in terms of its time of operation (months, days of the week, and hours), personnel requirements, maintenance requirements, and annual cost of operation and maintenance (OM&R). OM&R cost used for this analysis for each alternative is the "intermediate" level as defined on Page 17.

Plan 1 - Continue Current Operation

Plan 1 defines the requirements for maintenance of the current level of service provided by Locks 5 through 14.

Locks 5 through 14 are now closed to traffic from November through April. Locks 5-10 are open May-October on Friday-Sunday from 8:00 a.m. to 8:00 p.m. and Monday-Thursday from 12:00 a.m. to 8:00 p.m. Locks 11-14 are

open May through October on Thursday-Monday from 1200 a.m. to 8:00 p.m. and closed on Tuesday and Wednesday.

Personnel required to maintain this level of service include one Lockmaster at each lock (10), with one roving relief operator stationed at Lock No. 10 to cover vacations and sick leave periods. Under the current operation, temporary, part-time help is used during the open season and requires one employee at each lock (10).

Maintenance of the system includes minor channel clearing and dredging at locks and sandbar or debris removal in the channel at selected locations on an annual or biannual basis, as needed. Only during times of disaster - record flooding - are extensive dredging and maintenance required. Additionally, items classified as major maintenance include repair of guide or guardwalls, repair of lock gates and dam maintenance. The management philosophy utilized in this definition reflects a level of funding that permits the accomplishment of preventive maintenance; i.e., perform major required maintenance work prior to problem occurrence which would shut down part or all of the system.

The annual cost for this (preventive maintenance) level of service is estimated at \$1,731,000 per year. In addition to the personnel and maintenance requirements defined above, this cost includes engineering and design costs, district supervision and administrative costs, and costs for maintenance of rain gage and discharge measuring equipment. Water recording equipment is installed and maintained by the Corps, collected and read by USGS, and interpreted by District staff.

See Table 12 for the definition and comparison of each plan. Detailed development of OM&R costs for each plan is shown in Table 13.

Plan 2 - Suspend Locking Operations - Locks 5-14

The objective of Plan 2, as defined here, is to reduce O&M costs to the absolute minimum necessary for public health and safety. Included here is the objective of maintaining structures such that the pools behind each lock and dam are retained.

TABLE 17

ALTERNATIVE PLAN DEFINITIONS

Plan Descriptions	PLAN 1	PLAN 2	PLAN 3	PLAN 4	PLAN 5	PLAN 6
	Continue Current Operations Locks 5-14	Suspend Locking at Locks 5-14	Locking by Appointment at Locks 5-14	Continue Operations 5-10 Suspend Locking at 11-14	Continue Current Operations 5-10 Lock by Appointment 11-14	Lock by Appointment 5-10, Suspend Locking at 11-14
TIME OF OPERATION						
Locks 5-10	Locks closed Nov thru Apr	Locks closed year-round	Locks closed Nov-Apr	Locks closed Nov-Apr	Locks closed Nov-Apr	Locks closed Nov-Apr
Months	May-Oct					
Days	Fri-Sun 8AM-8PM					
Hours	Mon-Thur 12AM-8PM					
Locks 11-14	May-Oct					
Months	Thurs-Mon 12AM-8PM					
Days	Tues-Wed Closed					
Hours						
PERSONNEL REQUIREMENTS						
Lockmasters	10	10	10	10	10	10
Relief Operator	1	-	1	-	1	-
Temporary (May-Oct)	10	-	-	-	5	-
	Vacancies filled	Vacancies not filled 1/	Vacancies filled	Vacancies not filled	Vacancies filled	Vacancies not filled 1/
MAINTENANCE REQUIREMENTS						
	Recommended level to meet maintenance needs	Minimum necessary for public health and safety	Same as Plan 1	#5-10 - Same as Plan 1 #11-14 - Same as Plan 2	Same as Plan 1	#5-10 - Same as Plan 1 #11-14 - Same as Plan 2
ANNUAL COST						
Operating Costs	\$ 594,000	\$ 415,000	\$ 408,000	\$ 442,000	\$ 546,000	\$ 442,000
Maintenance Costs	1,185,000	5,000	1,185,000	593,000	1,185,000	593,000
Total Cost, Locks 5-14	1,779,000	420,000	1,683,000	1,035,000	1,731,000	1,035,000

1/ Vacancies not filled subject to maintaining staff level of 7 full-time/permanents.

TABLE 13

DETAILED ESTIMATES OF
OM&R COSTS FOR PLANS

	1	2	3	4	5	6
	Continue Current Operations	Suspend Locking 5 - 14	Locking by Appointment 5 - 14	Continue 5 - 10 Suspend Locking 11 - 14	Continue 5 - 10 Lock by Appointment 11 - 14	Lock by Appointment 5 - 10 Suspend Locking 11 - 14
<u>Operating Costs</u>						
Hired labor						
Full Time	292	265	292	265	292	265
Temporary	96	0	0	0	48	0
Operating Supplies	30	20	30	25	30	25
Maintenance of Bldgs., Grounds and Utilities	56	36	56	45	56	45
Water Control Mgmt. USGS	16	16	16	16	16	16
Supv. & Admin.	26	26	26	26	26	26
Operating Equip.	60	40	40	50	60	50
	<u>18</u>	<u>12</u>	<u>12</u>	<u>15</u>	<u>18</u>	<u>15</u>
Subtotal	594	415	498	442	546	442
<u>Maintenance Costs</u>						
Channel Clearing	200	5	200	100	200	100
Engrg & Design	20	0	20	10	20	10
Supv. & Admin.	65	0	65	33	65	33
Major Maint.	<u>900</u>	<u>5</u>	<u>900</u>	<u>450</u>	<u>900</u>	<u>450</u>
Subtotal	1,185	5	1,185	593	1,185	593
Total O&M, L&D 5-14	1,779	420	1,683	1,035	1,731	1,035

Under this plan, Locks 5 through 14 are closed year-round. Access to each pool by recreational craft would be available only through the limited access facilities.

Personnel requirements include one Lockmaster (10) at each facility in order to maintain the project in a safe and sanitary condition. In comparison to Plan 1, Plan 2 would eliminate one roving relief operator and 10 temporary part-time employees. As vacancies occur due to transfers, promotions, or retirements, Lockmasters would not be replaced subject to keeping approximately 5 to 7 permanent employees to cover the 10 locks.

Maintenance requirements are minimal, providing only those actions deemed necessary to maintain the project and facilities for public health and safety. Buildings, grounds, and utilities would be maintained. Navigational aids, i.e., safety buoys, would be maintained. No preventive maintenance would be scheduled; however, should major failure of any structure occur, a decision would be made based on impact or threat to public health and safety, and repairs made accordingly. Examples of the applicable management philosophy for Plan 2 are as follows:

If repair costs were minimal, in all cases an attempt would be made to obtain funds and make the necessary repairs.

If repair costs were substantial and no serious dangers or threats resulted to public health and safety, repairs would probably be deferred.

If repair costs were substantial and serious dangers or threats resulted to public health and safety, i.e., a possible loss of pool such that water supply for a community could be lost or endangered, efforts would be initiated to make the necessary repairs.

Annual costs for Plan 2 are estimated at \$420,000 made up of \$415,000 for operating costs and \$5,000 for maintenance costs. Maintenance costs included for Plan 2 cover limited periodic dredging near lock gates and maintenance or replacement of navigational or safety buoys.

Plan 3 - Locking by Appointment - Locks 5-14

Plan 3, locking by appointment, comes from suggestions made during the public involvement process. Although numerous options exist in terms of how appointments could be made, the result would be some form of reduced service that could be implemented by a requirement that appointments or scheduling be accomplished in order to lock through a facility. The same broad range of options could similarly consider some form of reduced time available for locking, such as would result from a reduction in months, days, or hours available for locking.

It is not critical that each of these options be defined or that details be specified. In short, Plan 3 requires that personnel and facilities be available to operate when called upon. As such, the only operational or maintenance activity that can be identified as not necessary is the use of temporary part-time help. Accordingly, Plan 3, from a cost standpoint, has essentially the same operational and maintenance requirements as Plan 1.

Plan 4 - Continue Current Operation (5-10) -- Suspend Locking at 11-14

Plan 4, as will Plans 5 and 6, also come from suggestions received through public involvement and reflect an effort to identify "compromise" plans -- "compromise" plans being plans that will provide some level of service between Plan 1 - continue current operations, and Plan 2 which provides no locking service.

Plan 4 makes a logical break in the Upper Kentucky River System by combining continued current operations for Locks 5 through 10 with suspension of locking operations at Locks 11 through 14. Plan 4 represents a compromise plan between Plans 1 and 2. The separation of the upper system into Locks 5-10 and Locks 11-14 is logical in that Locks 11 through 14 have significantly less public use than 5-10.

Under Plan 4, Locks 5-10 maintain essentially the same time of operation, personnel, and maintenance costs as Plan 1. Locks 11-14 would be closed year-round and therefore have the same personnel and maintenance requirements as Plan 2.

Annual costs for this plan are estimated at \$1,035,000, in comparison with Plan 1, reflect no relief operator or temporary help and a reduction in maintenance costs at Locks 11-14.

Plan 5 - Continue Current Operation at 5-10 -- Lock by Appointment at 11-14

Plan 5 was considered, as was Plan 4, as a combination of the management philosophies represented in Plans 1 and 3.

Time of operation for Locks 5-10 is the same as in Plan 1, while hours of operation at Locks 11-14 are the same as in Plan 3. The same operational and maintenance requirements exist for Plan 5 as for Plan 1 except that with reduced hours of operation at Locks 11-14, temporary help would not be needed from May through October.

Annual costs for Plan 5 are estimated at \$1,731,000 and reflect this operational and management philosophy.

Plan 6 - Lock by Appointment at 5-10 -- Suspend Locking at 11-14

Plan 6, from a cost standpoint, results in basically the same requirements as Plan 4. While the philosophy of operation differs between Plans 4 and 6, Locks 11-14 are treated the same as in Plan 4.

Annual costs of \$1,035,000 reflected the expected operation and maintenance requirements for Plan 6.

OTHER ALTERNATIVES

Several other alternatives were suggested by the public which generally fall in the category of alternative financing plans. Such plans include initiation of a user or service type charge, seeking funds from other Federal

or State agencies, and utilizing revenues from user charges on other systems or from other regions.

A number of letters and individuals indicated that forms of user charges, such as lockage fees, would be welcome and palatable to the boating public in lieu of suspending lock operations and as an aid in financing the cost of operating and maintaining the system. There are at least two reasons why this option (or variation) is not considered further. The amount of revenue that might be generated from a lockage fee of say \$2.00/lockage (considered to be an order of magnitude reasonable fee) would not exceed \$3,000 to \$6,000 per year based on 1978 and 1979 lockages and would probably not exceed additional administrative costs for collection. This amount is minimal compared to the O&M cost at Locks 5-14 of \$845,000 and \$1,699,000 in 1979 and 1978, respectively. The amount of revenue is less than 1 percent of the cost for Plan 2 previously defined. In comparison, lockage costs of \$500+/lockage would be required to cover the O&M cost of 5-14 in 1978 and 1979. Secondly, this alternative does not address the problem that based on high cost and low use, the system is not economically feasible and lastly, there is no authority to collect user charges. The time required for obtaining authorization by the Congress would likely exceed the interim period of study.

Alternative financing arrangements such as obtaining funds from other Federal or State agencies have either been tried before or could not be implemented in the short term (1981-1985). Informal discussion has been held as recently as 1977 with the Commonwealth of Kentucky at which time no interest was expressed in assuming responsibility for operation or maintenance of the system. Significant time would be required to analyze and develop studies and plans for determination by another State or Federal agency in assuming management responsibilities. The Kentucky River and Tributaries Survey Study will develop and analyze such options; they are beyond the scope and time of this Situation Study.

For these reasons, other alternative plans (financing alternatives) are given no further consideration under this situation report and assessment.

SUMMARY - ALTERNATIVES

Three representative alternative plans are retained for further evaluation and impact assessment. Plan 1 (Continue Current Operations) and Plan 2 (Suspend Locking Operations) are obvious candidates for further evaluation as they represent the existing condition and the recent proposal. Plans 1 and 2 further represent both ends of the "cost of operation commitment" and therefore are retained. While Plans 4 and 6 have the same operation and maintenance cost, Plan 4 is the more reasonable from both an operation and implementation standpoint. Plan 4 is therefore retained for further evaluation and Plan 6 is deleted. Plans 3 and 5 are also deleted in that they do not offer significant cost differences or advantages over those plans retained.

ALTERNATIVES EVALUATION

GENERAL

From the previous section's presentation and discussion of alternatives, three were selected for further evaluation. The remaining three alternatives represent the range of costs or cost savings available, depending on the choice of plans. This section therefore defines the decision criteria or impacts and how they vary among each plan. This section concludes by discussing the tradeoffs involved in selection of each plan. The results of the evaluation are presented in summary form in Table 14.

EVALUATION CRITERIA

Evaluation criteria are grouped as to economic, socioeconomic, environmental, and public wishes and desires. Each criteria is defined and its variation discussed relative to the three alternate plans.

Annual Cost

The annual costs of each plan, at current price levels, is presented in Table 14. The annual operation and maintenance cost estimate is that amount of expenditure necessary to provide the level of service represented by each plan, each year, for the 1981-1985 evaluation period. The annual cost, plus each year's inflation rate, would represent budget requests for each of the fiscal years 1981-85.

Present Worth of Deferred Maintenance

A second economic cost item, defined as deferred maintenance, is shown under each plan. At a \$2.2 million per year level of funding (optimum level) repairs necessary to maintain the Upper Kentucky River system structures in a safe and operable status could be accomplished in a 10-year period. For each alternative funded below this optimum level, at the end of the 5-year period of analysis (1981-1985), a period would follow (1986-1990) in which "catch up" maintenance would be required. This work would be required if the decision at

TABLE 14

PLAN EVALUATION AND DECISION MATRIX

Major Decision Criteria	Plan 1		Plan 2		Plan 4	
	Continue Current Operation 5-14	Suppend Locking 5-14	Continue Current Operation 5-10	Suspend Locking 11-14	Continue Current Operation 5-10	Suspend Locking 11-14
<u>ANNUAL COST</u>						
Financial Charges (O&H)	\$1,779,000	\$ 470,000	\$1,035,000		\$ 890,000	
<u>PRESENT WORTH DEFERRED MAINTENANCE 1/</u>	1,198,000	\$ 4,555,000	\$2,882,000			
<u>ANNUAL BENEFITS</u>						
Authorized Purposes - Traditional Measure	\$ 930,000	\$ 730,000	\$ 890,000			
Recreation	310,000		310,000			
Water Supply	260,000		260,000			
Hydropower	\$1,500,000		\$1,460,000			
<u>REGIONAL INCOME</u>	--	\$180,000 annual direct income and wages lost	\$85,000 annual direct income and wages lost			
<u>REGIONAL EMPLOYMENT</u>	--	17 part-time and 1 permanent job opportunity lost (Direct)	11 part-time and 1 permanent job opportunity lost (Direct)			
<u>RECREATION-HISTORIC EXPERIENCE</u>	Offers unique experience in locking and seeing palisades, Shakertown, Mooresboro by water	Unique experiences eliminated or significantly constrained	Unique experiences essentially retained			
<u>ENVIRONMENTAL</u>	Short-term, localized turbidity, fish disruptions and relocations	Adverse, short-term, localized impacts eliminated	Adverse, short-term, localized impacts 40 percent eliminated			
<u>PRIMARY BENEFICIARIES (No. of People)</u>						
Recreation 1/ (basin, region, outside-state)	620,000	490,000	590,000			
Water Supply 1/ (within basin)	324,000	324,000	324,000			
Hydropower 1/ (within basin)	1,500	1,500	1,500			
	2/	2/	2/			

1/ Present worth of increment in FY 1981 in maintenance 1986-1990 compared to optimum level funding.

2/ Not directly additive due to significance of multi-benefits/person.

the end of the 5 years was to restore full operation. It is further believed that if the decision were to continue reduced service or by some means transfer operation to another entity, the expenditures would be incurred prior to transfer or would be required to be incurred by the recipient.

For this reason, a deferred maintenance cost item is computed by applying present work factors to the annual increment in maintenance costs (years 1986-1990) for each plan, over the optimum level. These values are present worth at FY 1981 values.

Recreation Benefits

Plan 1

This alternative, which is to continue current operations, will have no effect upon recreation benefits. Based on a rate of \$1.50/visitor/day, annual recreation benefits are as follows:

<u>Year</u>	<u>Visitors</u>	<u>Benefits</u>
1981	610,300	915,400
1982	613,000	919,500
1983	617,600	926,400
1984	624,100	936,150
1985	632,600	948,900

For the projected years of 1981 through 1985, inclusively, the average annual benefit over the project reach is \$930,000.

Plan 2

This alternative involves suspension of all locking through Locks 5-14. Implementation of this alternative will preclude an estimated 3,198 pleasure craft from locking through the system. The following table shows expected lockages through the system for the near future (Locks 5 through 14).

Locks 5 through 14

Year	No. of Craft	No. of Boaters
1981	3,198	7,995
1982	3,082	7,705
1983	2,980	7,450
1984	2,875	7,188
1985	2,771	6,928

Assuming that 50% of these boaters would not recreate on the Kentucky River if Plan 2 were implemented, a loss of (7995 x 0.5) 3,998 boaters would occur in 1981.

It is anticipated that only 50% of the sightseers would visit the locks and dams and that the recreational value of the experience would be reduced to \$1.00/visitor/day. For 1981 the following benefits are obtained:

Sightseers:	186,200 x 0.5	x \$1.00 =	\$ 93,100
Boaters	: (424,100 - 3,998)	x \$1.50 =	<u>630,200</u>
Total Benefits			\$723,300
Rounded			\$720,000

By applying the same procedure to visitation for 1982-1985, the following results:

Locks 5 Through 14

Year :	1982	1983	1984	1985
Sightseeing Benefits:	\$ 94,050	\$ 95,000	\$ 95,950	\$ 96,900
Boating Benefits :	<u>631,570</u>	<u>635,813</u>	<u>642,909</u>	<u>653,004</u>
Total Benefits	\$725,620	\$730,813	\$738,859	\$749,904

The average annual recreation benefits for 1981-1985 are \$733,690.

Plan 4

This alternative involves suspension of all locking through Locks 11-14. Implementation of this plan would not diminish the overall quality of the recreation experience since the majority of the locking system would still be operable. The following table shows the number of pleasure craft and boaters that would be precluded from locking through should the upper locks be closed.

Locks 5 through 14

Year	No. of Craft	No. of Boaters
1981	220	550
1982	207	518
1983	196	490
1984	189	473
1985	184	460

A 10% loss in sightseers can be expected as a result of the proposed action. Application of the same procedure as in Plan 2 results in the following:

Sightseers:	186,200	x (1.0 - 0.1)	x \$1.50	= \$251,370
Boaters :	(424,100 - 550)		x \$1.50	= <u>635,325</u>
Total Benefits (1981)				\$886,695
Rounded				\$890,000

The following table shows benefits for 1982-1985.

Locks 5 through 14

Year :	1982	1983	1984	1985
Sightseeing Benefits:	\$235,935	\$256,500	\$259,065	\$261,630
Boating Benefits :	<u>636,573</u>	<u>640,665</u>	<u>647,591</u>	<u>657,510</u>
Total Benefits	\$872,508	\$897,165	\$906,656	\$919,140

Summary

The table below summarizes total recreation benefits.

Locks 5 through 14

<u>Year</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>Average Annual Benefits</u>
Plan 1	\$915,450	\$919,500	\$926,400	\$936,150	\$948,900	\$929,300
Plan 2	723,253	725,620	730,813	738,859	749,904	733,700
Plan 4	866,695	872,508	897,165	906,656	919,140	896,000

Incidental Purposes Benefits

In accord with Federal Water Resources policy, benefits are credited to each plan based on the least costly alternative for the incidental (purposes not authorized) benefits which actually accrue to the project for water supply and hydropower. Since Plans 2 and 4 do not impact on these beneficial project uses, the level of benefits remains the same for these plans.

Socioeconomic Factors

Socioeconomic factors pertinent to an evaluation of the impacts of the alternatives include income and employment opportunities lost as a result of each alternative action. Such income and employment losses are believed to be regional losses only and not national losses.

They may further be limited geographically to counties bordering the river and project since alternative water recreation opportunities exist in adjoining river basins and river systems. The losses do nevertheless occur to the immediate project area and are of concern to all persons interested in the project's continued operation.

Dock and Marina Income/Employment Losses

Gross income loss resulting from the closure of Locks 5-14 would amount to an estimated \$120,000 annually, of which \$15,000 would be attributable to closing Locks 11-14 only. Primary losses would result from decreased gasoline sales, and reductions in slip and boat rentals, as well as boat rides and repair fees. Overall, the income loss to the local economy could possibly be larger than the initial revenue loss, due to the multiplier effect. This means that monetary expenditures at the docks and marinas which would normally be passed on to employees in the form of wages, and to wholesale suppliers, who in turn, spend or invest portions of their income in the local economy, would be greatly reduced. Since the multiplier effect hinges on the fact that people respnd part of each increment of income they receive, if at any point the amount of income they may receive falls, the level of consumption also falls, and the respnding spiral stops short. The multiplier places major stress on spending, particularly investment spending, as an active force in rising and falling income levels. Another major determinant of respnding and investment is how good business has been in the recent past. Falling sales and profits, as can be expected with the closure of Locks 5-14, lead to reduced investment. This tendency of a change in consumption spending to induce or reduce additional investment is called the acceleration effect, which combines with the aforementioned multiplier to suggest the upswing or downswing of the local economy in terms of revenue gained or lost.

The multiplier in this case could be as high as three, indicating that income losses could possibly be in excess of \$360,000 annually in the local and regional economies. It follows that availability of jobs may be adversely impacted, as well, through this loss of revenue. Ultimately, a decline in total spending at the docks and marinas would necessitate a reduction in employment. In the case of the Kentucky River lock system, there are presently 14 part-time dock helpers employed at the marinas between Locks 5-14. In the event all the Locks 5-14 are closed, seven of the 14 part-time dock helpers will be unemployed, with a total wage loss of approximately \$10,000. If Locks 11-14 only are closed, one part-time employee will be lost at a yearly wage of \$1,000.

Federal Income/Employment Losses

Implementation of Plans 2 or 4 would result in loss (or transfer out of the region) of 10 temporary/part time jobs and one permanent job opportunity. This would be equivalent to approximately \$60,000 per year direct wage or income loss to the immediate area or \$180,000 annually in regional income flows.

Environmental Considerations

There are a number of both perceived and actual environmental impacts associated with the proposed action and its alternatives which have been identified throughout the evaluation process and through the public involvement process. Comments received in response to the public notice and obtained at the public hearing include concerns about degradation of water quality, increases in sedimentation, caving bank problems, impact on historic values and effects on natural and scenic aspects. Three viable alternatives have been identified which involve continued operation of the upper river, partial operation of the upper river or suspension of locking operations. These only involve changes in the operative management of the system and not physical change to the present system. There would be no effect on flow regime of the river and no changes in pool elevation. As a result, there will be no significant effects on the physical, biological, or chemical elements of the river or its environs. This means that existing water quality conditions in the river would not be altered, fish and wildlife resources would not be affected, there would be no effect on bank caving and sedimentation rates would remain unchanged.

Sedimentation is one area in which considerable public concern has been expressed. Most of this concern, however, is based on misconceptions and a lack of understanding of the physical process and the Corps maintenance dredging activity. The riverbed and flood plain are continually subject to erosive forces and materials eroded from the uplands are washed into and through the river system. Data available from the U. S. Geological Survey indicate that two to three million tons of sediment pass Frankfort annually as suspended material, which represents only part of the total sediment load.

Little data are available on the magnitude of the bedload--that fraction of the total sediment load which moves along the bed of the stream. It is this bedload which is the principal agent of channel filling. The transportation of this bedload is a function of the velocity of flow and is therefore related to high water conditions in the river. The central channel shifts and fills with or without the navigation system. If this filling results in a barrier to navigation, it is dredged and redeposited (generally back in the river) where it does not pose a problem to navigation. The volume of material which is dredged annually amounts to only a small fraction of the total volume of sediments which is deposited in the river, and in most cases this material is redistributed within the river, not removed from it. For these reasons the cessation of dredging operations would have no measureable effect on the overall capacity of the river channel.

Historical, Scenic, and Natural Values

Concern has also been expressed about effects on historic, scenic and natural values of the area. As none of the alternatives involves any physical changes to the system, there would not be any loss or damage to historic, scenic or natural features. However, closure of the locks would restrict access to the area thereby reducing the availability of these features and limiting the opportunity to experience them. A brief discussion of the predominant effects associated with each alternative is provided below.

Plan 1--Continue Current Operation

The environmental effects of this alternative are fully described in the environmental impact statement (EIS) and have been previously summarized. The most significant impacts are from maintenance dredging. These impacts are localized and short-term in nature.

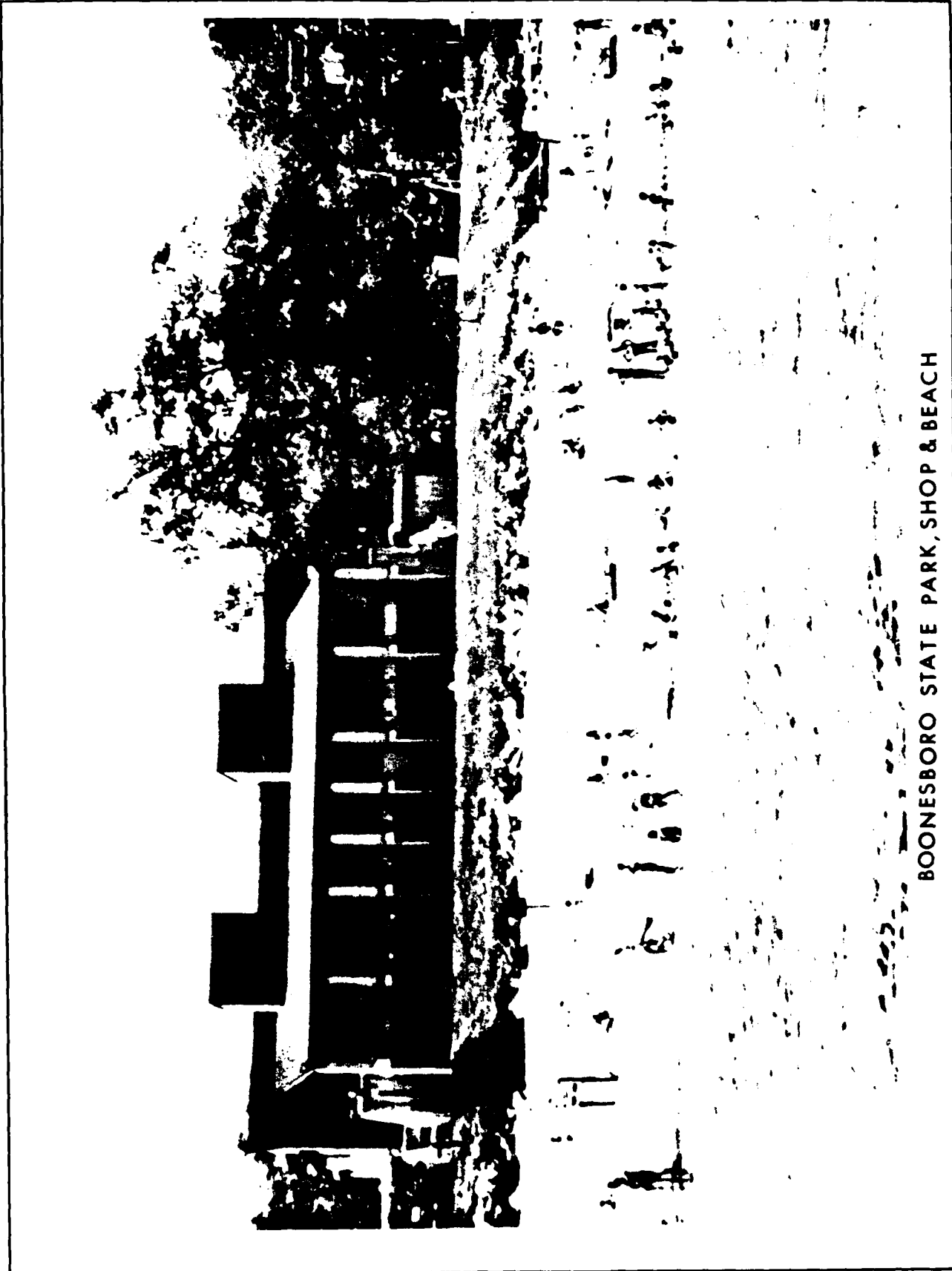
Plan 2--Suspend Locking Operation

This alternative would eliminate the short-term impacts associated with maintenance dredging. However, it would restrict access to historic, natural

and scenic features limiting the public's opportunity for enjoyment of these resources.

Plan 4--Continue Current Operation 5-10, Suspend Locking at 11-14.

This alternative would eliminate dredging impacts in the upper four pools while still allowing access to the natural, scenic and historic values centered in Pools 5-10. The palisades area in which much of the natural and scenic values are concentrated would be accessible. The majority of the pleasure craft usage in the upper river is in Pools 5-10 which provides river access to some of the more historic sites of Fort Boonesboro State Park (Figure 12) and Shakertown. This alternative would still permit experiencing the most historic sections of the navigation system.



BOONESBORO STATE PARK, SHOP & BEACH

DISCUSSION

In comparison with the optimum level of funding of \$2,200,000 per year (See Table 3), as required to minimize disruptions in service, Plans 1, 2, and 4 offer savings of approximately \$400,000, \$1,800,000, and \$1,200,000, respectively, per year for the interim period through 1985. While Plan 1 offers an alternative management philosophy for the level of maintenance to be performed, Plans 2 and 4 offer major alternatives in operation of the system.

At the levels of funding identified above for Plans 1, 2 and 4, certain maintenance needs are deferred to the future. These deferred maintenance costs may or may not be future Corps or Federal costs; however, it is expected these costs will accrue to the nation, if not through the Corps, then another Federal agency, State, or regional entity. Present worth of deferred maintenance shown in Table 14 was computed as the lump sum present worth in 1981 of increments in maintenance in 1986-1990, compared to the previously defined optimum level.

As a result of impact analysis it is concluded that recreation is the only measurable project benefit that would be adversely affected. Recreation benefits accruing to the project are reduced 21 percent for Plan 2 and 5 percent for Plan 4 through reduced or eliminated opportunities to lock and reduced value of the recreation experience for visitors to the project.

All three plans perform substantially better than previous reporting analysis has shown when incidental benefits are credited to the project. Some 40 percent of benefits actually accruing (not previously reported) to the project are classified as incidental and are nevertheless real and important to the region.

Many public statements expressed concern for degradation of water quality and adverse impacts on water supply if Plans 2 and 4 were implemented. On the surface and as analyzed in preceding sections of this report, no change would result in the quality or dependability of water quality or water supplies. It must, however, be recognized that certain risks exist, even under Plan 1, for interruption of water supply, exposure of intakes, and/or loss of pool

storage. With reduced or deferred maintenance under Plans 2 and 4 these risks are greater.

Environmental impact differences are not believed to be significant among the three plans and therefore should not be considered as a major decision factor.

Regional income and employment impacts are significant to the immediate region. Following the analysis of Federal and local expenditure changes, direct salary, income, and wage losses were estimated at \$85,000 to \$180,000 for Plans 4 and 2, respectively. Conservative use of an income multiplier effect of 3.0, boosts regional impacts to \$225,000 to \$540,000. Similarly, direct employment impacts were measured at 11 to 17 part-time jobs lost and one permanent job lost. Similar application of regional multiplier effects suggests the equivalent of 30 to 50 part-time jobs and three permanent job opportunities would be foregone.

A brief review of the various interests who benefit from continued operation of the project indicates that under existing conditions, 620,000 people originating from the region and out-of-state benefit annually from recreation opportunities offered by the project. Water supply benefits accrue to an estimated 324,000 people and hydropower benefits accrue to approximately 1,500 directly; secondary effects would reach beyond the basin and state.

CONCLUSIONS

The purpose of this study was to evaluate the impacts of various proposals and alternative management measures for reducing manpower and financial requirements of the Upper Kentucky River Navigation Projects. Conclusions of the study are summarized below.

The Upper Kentucky River locks and dams constitute an old, antiquated navigation system with some of these structures approaching 100 years old. Rehabilitation of equipment and features has not changed the basic configuration and dimensions designed for navigation equipment of past years.

Due to channel configuration, lock sizes, and locking and travel time, the system is incompatible with today's navigation equipment and fleet. The high prospective cost for shipment of commercial goods on the upper system is substantiated by the fact that no commercial tonnage has moved on the upper system in recent years. Savings in transportation costs for the authorized commercial navigation purpose never have been and do not now justify the required level of operation and maintenance costs.

Although recognized as seriously impacted by rising fuel costs and intermittently affected by temporary lock closures and adverse weather conditions, recreational boating is declining and the benefits therefrom do not justify the required level of operation and maintenance costs.

Near term prospects for commercial use of the Upper Kentucky River system are bleak as evidenced by the results of three independent studies, review of permit files, and recent discussion with businesses who had previously inquired about travel times, lock sizes, etc.

From the strict viewpoint of commercial navigation and traditional measures of recreation value, operation of the Upper Kentucky River Navigation Project appears to be unjustified.

However, the project does provide municipal and industrial water supply benefits to some 13 communities or 324,000 people. Visitation to the project and boater use of the river pools provided by the project, including the

unique experience of locking through the historic structures, accounts for an estimated 590,000 beneficiaries per year. The project provides hydroelectric service to the equivalent of 1,500 people per year. Thus, primary or direct beneficiaries of the project extend from the areas bordering the project to states on connecting waterways and number over 900,000 per year. Indirect or multiplier effects could extend the Upper Kentucky project's reach to more than 2,500,000 people annually.

Of major concern and importance is the public's perception of the effects and definition of "lock closures." Clearly the public feels that the Corps' proposal for "temporary closure is a ploy, when in fact, the Corps plans on permanent closure." With this public feeling existing, it is understandable that additional public concerns exist such as those in the areas of adverse impacts on water supply, water quality, recreation, and the regional economy. Based on this study and the Corps' definition of "temporary closure," most of the perceived adverse impacts are invalid. This is not, however, expected to alter the majority opinion and feeling, as evidenced by public input contained in Volume 2 of this report, that the Upper Kentucky River Project should continue to be operated and maintained by the Corps of Engineers. The public support for continued operation and maintenance is clearly established by the various state offices, including the Office of the Governor of Kentucky, the State Legislature, various county and municipal entities, and numerous organizations and individuals who voiced their feelings or were represented by the above groups. Additionally, as individuals and as representatives of the people, the Kentucky Congressional delegation is unified in its support of the Upper Kentucky River continued operation and maintenance. Finally, the nation's voice has expressed its intent that project operation be continued as evidenced by the most recent action, as of the writing of this report, which is, the inclusion of \$2,500,000 in the Senate Appropriation Subcommittee Report (on the FY 1981 Civil Works Appropriation Bill), for the Kentucky River Navigation Project and approval of same by the joint House and Senate Conference Committee.

Therefore, in view of:

- The uncertainty of savings that would accrue to the nation as a result of the previously proposed action.
- The overall national economic feasibility and impacts of the proposed action, including adverse impacts on jobs and income during the current period of high unemployment,
- Public perceptions of the effects and intent of Federal withdrawal from the project, and
- The apparent direction of Congressional intent, and the strong regional, state, and local support for continued operation and maintenance of the Upper Kentucky River Navigation Project, the following recommendation is appropriate.

RECOMMENDATIONS

It is recommended that Kentucky River Locks and Dams 5 through 14 be operated and maintained in accordance with present practice pending required action that may arise from recommendations expected to be forthcoming in a report on the "Kentucky River and Tributaries" study presently scheduled for completion during FY 1984; provided that during this interim period expenditures for maintenance be limited to those items necessary to assure operability of these facilities during the near term; and, provided further that the minimal required funds and manpower are available for this purpose.

C. E. EASTBURN
Colonel, Corps of Engineers
District Engineer