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**CLARENCE CANNON DAM AND  
MARK TWAIN LAKE  
SALT RIVER, MISSOURI**

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**DESIGN MEMORANDUM NO. 9**

**THE MASTER  
PLAN**



**US Army Corps  
of Engineers**  
St. Louis District®

**Original 1969  
Updated 1991, 2004**

PREVIOUSLY ISSUED DESIGN MEMORANDA  
CLARENCE CANNON DAM & MARK TWAIN LAKE

<u>MEMORANDUM NO.</u>	<u>TITLE</u>	<u>SUBMITTED/ APPROVED</u>	
1	Hydrology and Hydraulic Analysis	Sep	1963
1	Hydrology and Hydraulic Analysis (Revised)	Jan Jul	1967 1967(1 <sup>st</sup> Ind)
2	Hydropower Capacity	Jan	1965
2	Hydropower Capacity (revised)	Feb Jul	1967 1967(3 <sup>rd</sup> Ind)
3	General Design Memorandum	May	1965
3	General Design Memorandum (Revised)	Mar Mar	1967 1968(3 <sup>rd</sup> Ind)
	Low flow Regulation	Apr Sep	1968 1968(5 <sup>th</sup> Ind)
4A	Site Geology	Jun Aug	1966 1966
5	Availability of Construction Materials	Dec Jun	1967 1968(9 <sup>th</sup> Ind)
5	Supplement 1	Oct Aug	1971 1972(6 <sup>th</sup> Ind)
5	Supplement 2	May	1972
6	Real Estate-Main Dam, Reservoir, Public Use Areas	Jun Jan	1966 1967(5 <sup>th</sup> Ind)
6	Supplement 1	Prepared but not submitted	
6	Supplement 2	Oct Nov	1984 1984(1 <sup>st</sup> Ind)
6A	Real Estate-Re-Reg Dam	Aug Nov	1967 1967(3 <sup>rd</sup> Ind)

<u>MEMORANDUM NO.</u>	<u>TITLE</u>	<u>SUBMITTED/ APPROVED</u>
6A	Supplement 1	Nov 1973 Nov 1973 (1 <sup>st</sup> Ind)
6A	Supplement 2	Oct 1979 Nov 1979 (1 <sup>st</sup> Ind)
6A	Supplement 3	Aug 1977 Dec 1978(1 <sup>st</sup> Ind)
6A	Supplement 4	Jun 1980 Oct 1980 (3 <sup>rd</sup> Ind)
7A	Preliminary Master Plan	May 1966 Sep 1966(1 <sup>st</sup> Ind)
7A	Supplement 1	Jun 1967 Aug 1967 (5 <sup>th</sup> Ind)
8	Relocations-Railroads	May 1968 Apr 1969 (7 <sup>th</sup> Ind)
8	Supplement 1	May 1968 Aug 1971(11 <sup>th</sup> Ind)
8	Supplement 2	Jul 1971 Aug 1971(1 <sup>st</sup> Ind)
8	Supplement 3	Jan 1976 Jun 1976(3 <sup>rd</sup> Ind)
9	The Master Plan	Aug 1968 May 1969(7 <sup>th</sup> Ind)
9	Supplement 1	Jul 1975 Jan 1976 (3 <sup>rd</sup> Ind)
9	Supplement 2	Mar 1976 Jun 1976(1 <sup>st</sup> Ind)
9	Supplement 3	Sep 1977 Dec 1977(3 <sup>rd</sup> Ind)
9	Supplement 4	Jan 1978 Feb 1978 (1 <sup>st</sup> Ind)

<u>MEMORANDUM NO.</u>	<u>TITLE</u>	<u>SUBMITTED/ APPROVED</u>
9	Supplement 5	Nov 1979 Jun 1980(2 <sup>nd</sup> Ind)
9	Supplement 6 – Hunter/Fisherman Access Areas	Mar 1980 May 1980 (1 <sup>st</sup> Ind)
9	Supplement 7 – Additional Recreational Facilities	Feb 1982 Apr 1982 (1 <sup>st</sup> Ind)
9	Supplement 8	May 1987 Jun 1987 (1 <sup>st</sup> Ind)
10	Generator and Generator Motor	Dec 1968 Jun 1969(3 <sup>rd</sup> Ind)
11	Administration Building and South Overlook	Apr 1969 Dec 1969 (5 <sup>th</sup> Ind)
11	Supplement 1	Nov 1976 Apr 1977(5 <sup>th</sup> Ind)
11	Supplement 2	Oct 1977 Mar 1978 (5 <sup>th</sup> Ind)
11	Supplement 3	Oct 1979 Dec 1979 (3 <sup>rd</sup> Ind)
12	Embankment Design-Main Dam	Nov 1969 May 1971 (9 <sup>th</sup> Ind)
13	Phase II - Main Dam	Aug 1970 Oct 1972 (8 <sup>th</sup> Ind)
	Main Dam Embankment Phase I (Revised)	Oct 1978
14	Instrumentation and Evaluation Program	Jul 1971 Dec 1972 (7 <sup>th</sup> Ind)
15	Re-regulation Dam and Spillway	Jun 1971 Feb 1975 (9 <sup>th</sup> Ind)
16	Relocations of State Highways	Oct 1972 Nov 1972 (1 <sup>st</sup> Ind)

<u>MEMORANDUM NO.</u>	<u>TITLE</u>	<u>SUBMITTED/ APPROVED</u>
16	Supplement 1	Sep 1973 Oct 1973(5 <sup>th</sup> Ind)
16	Supplement 2	Dec 1973 Feb 1975 (3 <sup>rd</sup> Ind)
16	Supplement 3	Apr 1974 Apr 1975 (5 <sup>th</sup> Ind)
16	Supplement 4	Oct 1975 Feb 1976 (7 <sup>th</sup> Ind)
17	Turbine and Pump Turbine Governors	Sep 1973
18	Relocations Utilities	Aug 1973 Mar 1975(7 <sup>th</sup> Ind)
18	Supplement 1	Jun 1976 Aug 1976(1 <sup>st</sup> Ind)
18	Supplement 2	May 1978 Dec 1978(3 <sup>rd</sup> Ind)
18	Supplement 3	Oct 1980 Oct 1980(1 <sup>st</sup> Ind)
18	Supplement 4	Jun 1983 Aug 1983 (3 <sup>rd</sup> Ind)
19	Relocations Cemeteries	Jul 1975 Mar 1976(4 <sup>th</sup> Ind)
20	Relocations County Roads	May 1975 Jun 1975 (1 <sup>st</sup> Ind)
20	Supplement 1	Aug 1980 Sep 1980 (1 <sup>st</sup> Ind)
20	Supplement 2	Jul 1982 Dec 1982 (4 <sup>th</sup> Ind)
21	Wastewater Land Treatment System	Dec 1976 Sep 1977 (9 <sup>th</sup> Ind)

MEMORANDUM  
NO.

TITLE

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APPROVED

21	Supplement 1	Oct 1979 Jan 1980(3 <sup>rd</sup> Ind)
22	Initial Reservoir Filling Plan	Mar 1983 Oct 1983(3 <sup>rd</sup> Ind)
23	Analysis of Hydropower Design	Feb 1986
24	Final Cost Allocation Study	Fiscal Year 1986 Fiscal Year 1987

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## PREFACE

Construction of Joanna Dam and Lake (later changed to Clarence Cannon Dam and Mark Twain Lake) was authorized in 1962 and work began in 1966. The project was completed in August 1984. The original Master Plan was approved in 1968, revised in 1975 and updated in 1991. The Master Plan has served as a guide for the orderly development and management of the land and water resources of the project.

This updated Master Plan presents a current inventory and assessment of land and water resources and physical improvements, current resource use objectives, discussions of influences on lake operation and management and an evaluation of current and future measures required to protect the value of the resource base. Emphasis has been placed on increasing the efficiency of operations and the rehabilitation of facilities to assure public safety.

Although Mark Twain Lake is managed primarily by the St. Louis District U.S. Army Corps of Engineers, many others play a crucial role in the operation of the project. These important players include the Missouri Department of Natural Resources, Missouri Department of Conservation, marina concessionaires, local organizations and businesses, and youth groups. The objective of the Mark Twain Lake Master Plan is to meet the needs and interests of the various users of the project and outline a 10-year plan of action assuring that all project purposes are addressed.

All aspects of lake operation have been reevaluated due to changes that have taken place since the last update in 1991. All recreation area site plans have been revised to reflect existing development.

The plan will be approved in the St. Louis District; however, this does not assure that all proposed projects will be completed. After approval, funding must be secured to complete the proposed projects.

## SECTION I – INTRODUCTION

### 1.01 AUTHORIZATION

Federal laws provide that land and water areas of Department of the Army reservoirs, constructed for the primary purposes of flood control, navigation and/or hydropower, shall be administered to encourage and develop all collateral uses such as water supply, public parks and recreation, conservation of fish and wildlife resources, pollution abatement, and other purposes in the public interest.

The Flood Control Act of 28 June 1938 authorized a dam and reservoir on the Salt River near Joanna, Missouri, as part of a general comprehensive plan for flood control in the Upper Mississippi River Basin. A restudy of the project indicated the feasibility of a multi-purpose development, including hydroelectric power. The project was authorized as such by Sec. 203 of the Flood Control Act of 23 October 1962 (PL 87-874), as recommended by the Chief of Engineers in House Document No. 507, 87th Congress, 2nd Session. The reservoir, originally named the Joanna Reservoir, was officially renamed Clarence Cannon Dam and Reservoir by Public Law 89-298, 89th Congress, 3rd Session on 27 October 1965. Clarence Cannon Dam and Reservoir was officially renamed Clarence Cannon Dam and Mark Twain Lake by PL 97-128, 97th Congress, 29 December 1981.

This plan has been prepared in accordance with guidance contained in the following:

- a. ER 1165-2-400 Water Resource Policies and Authorities: Recreation Planning, Development and Management Policies (chg 1,1988).
- b. ER 1110-2-400 Design of Recreation Sites, Areas, and Facilities (1988).
- c. ER 1130-2-540 Environmental Stewardship Operations and Maintenance Policies (chg.1, 2002).
- d. EP 1130-2-540 Environmental Stewardship Operations and Maintenance Guidance and Procedures (chg.1, 2002).
- e. EM 1110-1-400 Recreation Planning and Design Criteria (1987).
- f. ER 1130-2-550 Recreation Operations and Maintenance Policies (chg. 3, 2002).
- g. EP 1130-2-550 Recreation Operations and Maintenance Guidance and Procedures (chg. 3, 2002).

- h. ER 1130-2-406 Shoreline Management at Civil Works Projects (chg. 2, 1999).
- i. ER 405-1-12 Real Estate Handbook (1985)
- j. ER 1105-2-100 Planning Guidance Notebook (2000)
- k. Final Environmental Statement; Mark Twain Lake, Missouri (Operation and Maintenance) 1975

### 1.02 PROJECT PURPOSES

The authorized purposes of the project are flood control in the Salt River Basin, hydroelectric power generation, water supply, fish and wildlife conservation, recreation, and incidental navigation.

### 1.03 PURPOSE OF THE MASTER PLAN

The original Master Plan was intended as a guide for the orderly and coordinated development and management of all lands and water areas of the project. It presented data on the scope of development considered adequate for initial public use and an estimate of future requirements. This updated Master Plan presents an inventory and assessment of land and water resources and physical improvements, an analysis of resource use and an evaluation of existing and future needs required to protect and improve the value of the resource base. The provision of quality and relevant services to the public was also evaluated.

### 1.04 PRIOR PERTINENT DESIGN MEMORANDA

a. The 1991 update of the Master Plan was supplemented eight times. The following is a brief summary of those eight supplements.

(1) Supplement 1, 19 March 1991, requested that the Spillway Recreation Area be renamed the Warren G. See Spillway Area. Total estimated cost was \$1500. Approved by CELMV-PD-R on 4 April 1991.

(2) Supplement 2, 29 September 1994, presented the request by the Northeast Missouri Area Vietnam Veterans Inc. to construct a memorial at the M. W. Boudreaux Memorial Visitor Center for Northeast Missouri soldiers who died in the Vietnam war. Total estimated cost of the project was \$45,000. Approved by CELMV-PE-R on 28 October 1994

(3) Supplement 3, 8 August 1995, requested approval of a three-year road improvement and maintenance project for paved surfaces with a request for

special funding. The three-year project cost was estimated at \$1,586,621. The project without the special funding was approved on 18 October 1995 by CELMV-ET-PR.

(4) Supplement 4, 11 October 1995, proposed a marina development at the North Extension lease area of Mark Twain State Park, fish cleaning stations in several recreation areas, an amphitheater at Frank Russell campground, a vault toilet and multi-purpose shelter in the Warren G. See South Spillway Recreation Area, a wetland restoration project in the North Fork area, and high water accesses at three locations. Total estimated cost was \$186,013. CELMV-ET-PR approved the supplement on 12 January 1996.

(5) Supplement 5, 23 July 1997, proposed a shooting range with a parking lot, road maintenance on an existing unsurfaced access road, and 3 minimum facilities for public health and safety including a 5 car/trailer access lot, and a 20 car gravel access lot. It also reflected a boundary change due to a recent land acquisition. Total estimated cost for all projects with contingencies was \$155,250. The St. Louis District Engineer approved the supplement on 23 July 1997.

(6) Supplement 6, 12 February 1999, proposed six comfort station shower additions at Ray Behrens and Indian Creek, two handicapped fishing accesses in the Spillway, an extension to the Joanna Trail, land acquisition for the Joanna Trail, relocation of the John F. Spalding bathhouse and the Indian Creek comfort station to higher ground, expansion of the Spalding wastewater treatment plant, continuation of special emphasis programs for youth, seniors and physically challenged individuals in various recreation areas, construction of a non-discharge sewage treatment lagoon and upgrade of the vault toilet to waterborne with a shower facility in the South Spillway Recreation Area, and designation of the Joanna Loop in the Frank Russell Campground for equine use. Total cost of proposed items is \$1,560,436. The supplement was approved by the St. Louis District Engineer on 16 February 1999.

(7) Supplement 7, 24 August 2001, proposed re-designating the Mark Twain State Park marina site as a beach, adding a swimming facility at Camp Colborn, Mark Twain State Park, upgrading the campsite electrical service at the Indian Creek and Ray Behrens Recreation Areas, adding two shelters and an earthen berm with a concrete retention wall at the special events area of the South Spillway Recreation Area, adding an archery range at the Ray Behrens Recreation Area, and installing full hookups at campsites in the Indian Creek and Ray Behrens Recreation Areas. Total estimated cost was \$1,163,750. Supplement was approved by St. Louis District Engineer on 24 August 2001.

(8) Supplement 8, 8 March 2002 proposed renaming the M.W. Boudreaux Group Use Area in recognition and memory of John C. "Jack" Briscoe for his outstanding leadership, contributions and support to Northeast Missouri and to the Clarence Cannon Dam and Mark Twain Lake project. Total estimated cost

was \$1300.00. Supplement was approved by St. Louis District Engineer on 12 March 2002.

### 1.05 APPLICABLE PUBLIC LAWS

Development and management of Federal reservoirs for various purposes is provided under several statutes. These laws cover development of recreation facilities, licensing of project lands for fish and wildlife purposes, protection of natural resources, and leasing of project lands for incidental uses other than recreation. In addition, applicable legislation for cultural resource protection at this project is listed.

a. Recreation. Development and management of recreation facilities by the Corps, other governmental agencies, local groups, or individuals is authorized under the following public laws:

(1) Section 4 of the Flood Control Act, approved 22 December 1944 (PL 78-534), authorizes providing facilities for public use, including recreation, and conservation of fish and wildlife.

(2) The River and Harbors Act, approved 2 March 1945 (PL 79-14), specifies the rights and interests of the states in watershed development and water utilization and control, and the requirements for cooperation with state agencies in planning for flood control and navigation improvements.

(3) Section 209 of the Flood Control Act of 1954 (PL 83-780), approved 3 September 1954, amended the Flood Control Act of 1944. It authorized the Secretary of the Army to grant leases to federal, state or governmental agencies without monetary considerations for use and occupation of land and water areas under the jurisdiction of the Department of the Army for park and recreation purposes when in the public interest.

(4) The Land and Water Conservation Fund Act of 1965 (PL 88-578), approved 1 September 1964, contains provisions by which the Corps may charge for admission and use of its recreation areas under prescribed conditions.

(5) The Federal Water Project Recreation Act (PL 89-72), approved 9 July 1965, contains cost sharing provisions for acquisition of lands and development of recreation facilities for water resources projects authorized after 1965. It also provides for cost sharing development of new areas that were not part of initial project construction.

(6) The Architectural Barriers Act of 1968 (PL 90-480), together with the acts and amendments listed in 7, 8, and 9 below, provides information and guidance regarding universal accessibility for persons with disabilities to the Corps recreation facilities and programs.

(7) The Rehabilitation Act of 1973 (PL 93-112) and the Rehabilitation Act Amendments of 1974 (PL 93-516) (see Architectural Barriers Act above).

(8) The Rehabilitation, Comprehensive Services, and Developmental Disabilities Amendments of 1978 (PL 95-602) (see Architectural Barriers Act above).

(9) The Americans with Disabilities Act of 1990 (PL 101-336) (see Architectural Barriers Act above).

(10) The Water Resources Development Act of 1992 (PL 102-580), approved 31 October 1992, authorized the Challenge Cost Sharing Program (Section 225) that permits the Corps to develop and implement a program to accept contributions of funds, materials and services from non-Federal public and private entities to be used in managing recreation facilities and natural resources. This is now known as the Challenge Partnerships programs.

(11) The Omnibus Budget Reconciliation Act - Day Use Fees, approved 10 August 1993 (PL 103-66), contains provisions by which the Corps may collect fees for the use of developed recreation sites and facilities, including campsites, swimming beaches, and boat launching ramps but excluding boat launching ramps in undeveloped or lightly developed areas with minimum security and illumination.

(12) The Water Resources Development Act of 1996 was approved 12 October 1996. Section 208 (Recreation Policy and User Fees) directed the Corps to put increased emphasis on recreation opportunities at Corps projects and specifies that a portion of recreation fees collected at Corps projects remain for use at the project where they are collected. Section 519 (Recreation Partnership Initiative) directed that, in general, the Corps is to promote federal, non-federal, and private sector cooperation in creating public recreation opportunities at Corps projects.

b. Fish and Wildlife. Fish and wildlife resources are maintained and protected in compliance with the following public laws:

(1) The Fish and Wildlife Coordination Act, enacted 10 March 1934, as amended, 14 August 1946 (PL 79-732), 1958 (PL 85-624), provides authority for making project lands of value for wildlife purposes available for management by interested federal and state wildlife agencies. It further provides for more effective integration of a fish and wildlife conservation program with federal water resources developments.

(2) The National Environmental Policy Act of 1969, as amended (42 USC 4321 et seq), declares a national environmental policy and requires that all federal agencies shall, to the fullest extent possible, use a systematic, interdisciplinary approach which integrates natural and social sciences and environmental design arts in planning and decision making.

(3) The Endangered Species Act of 1973 as amended (16 USC 1531 and 1536) requires that federal agencies shall, in consultation with the U.S. Fish and Wildlife Service (USFWS) (or the National Marine Fisheries Service), use their authorities in furtherance of conserving endangered and threatened species and take such action as necessary to assure that their actions are not likely to jeopardize such species or destroy or modify their critical habitat.

(4) The Water Resource Development Act of 1986, Section 1135, provides for modifications in the structures or operations of a project, consistent with authorized project purposes to improve the quality of the environment, i.e. restoration of fish and wildlife habitat. WRDA 1996 amended Section 103 of WRDA 1986 by specifying that the non-federal share of environmental restoration and protection projects shall be 35 percent.

(5) Executive Order 12962, 7 June 1995, entitled Recreational Fisheries directs Federal agencies to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities by means of a number of duties. In addition, it establishes a National Recreational Fisheries Coordination Council consisting of seven members (including one designated by the Secretary of Defense). The "Coordination Council" is charged with developing a comprehensive Recreational Fishery Resources Conservation Plan. This EO also directs all Federal agencies to identify and minimize conflicts between recreational fisheries and their responsibilities under the Endangered Species Act of 1973 and expands the role of the Sport Fishing and Boating Partnership Council.

c. Forest Resources - Protection and Improvement of Natural Resources. The Forest Conservation Act (PL 86-717) approved 6 September 1960, provides for the protection of forest cover in reservoir areas, and specifies that reservoir areas of projects for flood control, navigation, hydroelectric power development, and other related purposes, owned in fee and under the jurisdiction of the Secretary of the Army and the Chief of Engineers, shall be developed and maintained so as to encourage, promote and assure fully adequate and dependable future resources of readily available timber through sustained yield programs, reforestation, and accepted conservation practices, and to increase the value of such areas for conservation, recreation and other beneficial uses; provided, that such development and management shall be accomplished to the extent practicable and compatible with other uses of the project. The law further provides that in order to carry out the national policy declared in the first section of this Act, the Chief of Engineers, under the supervision of the Secretary of the Army, shall provide for the protection and development of forest or other vegetative cover and the establishment and maintenance of other conservation measures on reservoir areas under his jurisdiction, so as to yield the maximum benefit and otherwise improve such areas. Programs and policies developed pursuant to the preceding sentence shall be coordinated

with the Secretary of Agriculture, and with appropriate state conservation agencies.

d. Other Incidental Uses. Title 10, United States Code, Section 2667, authorizes the lease of land at water resource projects for any commercial or private purpose not inconsistent with other authorized purposes, subject to specific restrictions thereupon, as set out in regulations, policy, and Delegations of Authority. Title 16, United States Code, Section 460d, authorizes use of public lands for any public purpose, including fish and wildlife, if it is in the public interest. Such uses are also subject to regulations, policy and Delegations of Authority. The use of project lands for easements and licenses is authorized in various Congressional Acts and codified in Titles 10, 16, 30, 32 and 43 of the United States Code. Lands and rights-of-way will be acquired pursuant to provisions of the Uniform Real Property Acquisition and Relocation Assistance Act of 1970, PL 91-646, as amended.

e. Cultural and Historical Considerations. A number of laws mandating the protection of cultural resources on public lands have been passed during the past 95 years. These laws and Executive Orders are summarized in Appendix A of the St. Louis District Cultural Resource Management Policy (April 1982). The following laws subsume, clarify or supersede all previous cultural resource law:

(1) The National Historic Preservation Act of 1966 (PL 89-665) approved 15 October 1966, as amended through 2000 (PL 91-243, PL 93-54, PL 94-422, PL 94-458, PL96-1999, PL 96-244, PL 96-515, PL98-483, PL 99-514, PL 100-127, PL 102-575, PL 103-437, PL 104-333, PL 106-113, PL 106-176, PL 106-208, and PL 106-355), states a policy of preserving, restoring, and maintaining cultural resources and requires that federal agencies take into account the effect any undertaking may have on sites that may be eligible for inclusion on the National Register of Historic Places.

(2) The Archaeological and Historic Preservation Act of 1974 [as amended (16 USC 469-469c)], amended the 1960 Reservoir Salvage Act (PL 86-523), and provides for the preservation of historical and archaeological data that might otherwise be lost or destroyed as the result of flooding or any alteration of the terrain caused as a result of any federal construction projects.

(3) American Indian Religious Freedom Act of 1978 (PL 95-341) enacted on 11 August 1978, protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites

(4) The Archeological Resources Protection Act of 1979 (16 USC 470 et seq.), PL 96-95, 96th Congress Revision and update of 1906 Antiquities Act protects archaeological resources and sites that are on public lands and Indian

land, and fosters increased cooperation and exchange of information between governmental authorities, the professional community, and private individuals.

(5) The Native American Graves Protection and Repatriation Act (PL 101-601) was enacted on 16 November 1990 and requires federal agencies and museums to inventory and summarize human remains, funerary objects, sacred objects, and objects of cultural patrimony and to provide this information to potentially affiliated Native American Tribes. The Act requires repatriation of these items, upon request and following the guidelines in 43 CFR Part 10, to the cultural affiliated tribe(s) and establishes a grant program within the Department of the Interior to assist tribes with repatriation and museums in preparing the inventories and collection summaries. The act also outlines the procedures that Federal agencies must follow in the event of an inadvertent discovery or intentional excavation of human remains and funerary objects from federal or tribal lands.

(6) Indian Sacred Site, Executive Order 13007, signed on 24 May 1996, directs federal land-managing agencies to accommodate Native American use of sacred sites for religious purposes and to avoid adversely affecting the physical integrity of sacred sites. Agencies are required to develop procedures for reasonable notice to tribes of a proposed action or land management policy that may restrict access to, or ceremonial use of, a sacred site or adversely affect its physical integrity.

(7) The Water Resources Development Act of 2000, Section 208, authorizes the army to rebury Native American human remains that were discovered on Civil Works project lands and have been rightfully claimed by a tribe on those lands.

### 1.06 MISSION STATEMENT

Programs and activities related to environmental stewardship and the Natural Resource Management Program have as their design base the following Corps of Engineers Civil Works mission statement:

“The Army Corps of Engineers is the steward of lands and waters at Corps water resources projects. Its Natural Resources Management Mission is to manage and conserve those natural resources, consistent with ecosystem management principles, while providing quality public outdoor recreation experiences to serve the needs of present and future generations.

In all aspects of natural and cultural resources management, the Corps promotes awareness of environmental values and adheres to sound environmental stewardship, protection, compliance and restoration practices.

The Corps manages for long-term public access to, and use of, the natural resources in cooperation with other federal, state, and local agencies as well as the private sector.

The Corps integrates the management of diverse natural resource components such as fish, wildlife, forest, wetlands, grasslands, soils, air and water with the provision of public recreation opportunities. The Corps conserves natural resources and provides public recreation opportunities that contribute to the quality of American life.”

#### 1.07 SCOPE OF REPORT

This memorandum is the second update of the Clarence Cannon Dam and Mark Twain Lake Master Plan. It is primarily oriented to reflect current conditions and eliminate outdated information concerning the allocation of lake resources. This update reflects the current status of Clarence Cannon Dam and Mark Twain Lake land and water use classifications and the status of proposed and future plans.

## SECTION II - PROJECT DESCRIPTION

### 2.01 LOCATION

Clarence Cannon Dam and Mark Twain Lake are located on the Salt River in northeastern Missouri, generally in Monroe and Ralls Counties. The main dam site is located at mile 63.0 on the Salt River, about 12 miles southeast of Monroe City, in Ralls County, Missouri. A re-regulation dam is located 9.5 miles downstream from the main dam site. The project area is served on the north by U.S. Highway 24 and on the south by State Highway 154. State Highway 107 runs north and south through the project area, providing a major reservoir crossing near Florida, Missouri. State Highway J crosses the main dam and is a major north-south reservoir route on the east end of the lake.

### 2.02 LAKE DATA

a. Climatological Data. The climate of the area is considered moderate.

(1) Temperature. The summers are generally mild with occasional temperatures slightly in excess of 100 degrees Fahrenheit. Periods of extreme heat are usually short, if accompanied by sufficient rainfall. Winters are usually moderate, although periods of extremely cold weather are experienced. Weather changes and temperature fluctuations are frequent throughout the year with the extremes varying from 116 to -31 degrees Fahrenheit. Average temperatures by months during the recreation season in counties contiguous to the reservoir in degrees Fahrenheit are as follows: April 54°, May 64°, June 74°, July 78°, August 76°, and September 68°.

(2) Wind. The maximum wind movement occurs in March and the minimum in August. The average wind velocity is about 10.3 miles per hour. The prevailing winds over the basin are generally from the south.

(3) Humidity. The relative humidity varies from about 59 percent to 86 percent in the winter and from 51 percent to 89 percent during the remainder of the year.

(4) Precipitation. The annual average precipitation over the drainage area above the dam site is about 37.1 inches. Two-thirds of the annual rainfall normally occurs during the spring and summer, with local cellular storms occurring generally in July and August. Average annual snowfall amounts to about 21 inches and is usually limited to the period from November to March. The snow cover seldom lasts for more than a few days at a time.

b. Lake Shoreline, Length, and General Character. The topography at Mark Twain Lake reaches a maximum elevation of about 780 feet NGVD<sup>1</sup> in the southwestern portion of the project to a minimum of approximately 520 feet NGVD along the main stream of the Salt River. The North Fork, Middle Fork, Elk Fork and South Fork are the main tributaries of the Salt River within the project boundaries and have a maximum elevation of 675 feet NGVD in the western part of the project. The sides of the major valleys are dissected by short tributaries whose gradients extend from the flat uplands to the valley bottoms, and the divides between these tributaries form a continuous belt of hills along either side of the major valleys. The land adjoining the project is relatively flat farmland. The reservoir covers approximately 18,600 acres and has a shoreline of approximately 285 miles at the normal pool level of 606. The average depth of the pool at the 606 feet NGVD is 29 feet.

c. Project Structures. Project structures include components of the Clarence Cannon Dam and the Re-regulation Dam.

(1) Clarence Cannon Dam. Clarence Cannon Dam consists of a compacted earth embankment, a gated concrete spillway, a concrete hydroelectric power plant and a water temperature control weir. State Highway J crosses the top of the Dam. The total length of the dam is 1,940 feet with the centerline of the dam running in a near north-south direction. The concrete portion of the dam is 845.75 feet in length and it abuts the southern rim of the valley.

(a) Earth Embankment. The compacted earth embankment, which is topped by State Highway J, has a crest elevation of 653.0 NGVD. The embankment is about 1,094 feet in length.

(b) Spillway. The spillway is part of the concrete portion of the dam and is 230 feet in length. It begins 360 feet from the southern rim of the valley. The spillway is topped by four 50-foot wide by 39-foot high tainter gates separated by 10-foot wide piers. The spillway crest elevation is 600.0 feet NGVD. A 230-foot wide by 198.86-foot long stilling basin, with two rows of baffle piers and an end sill, is provided for the purpose of energy dissipation. The stilling basin floor is at elevation 508 feet NGVD.

(c) Power Plant. The power plant is part of the concrete portion of the dam and is located immediately north of the spillway. The power plant is 222.75 feet in length. The power plant contains a Kaplan 27,000-KW turbine generator and a Francis 31,000-KW pump turbine generator. The invert elevation of the intake structure is 520.0 feet NGVD. The invert elevation of the outlet structure is 483.0 feet NGVD.

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<sup>1</sup> Note: All elevations cited are in terms of the National Geodetic Vertical Datum (NGVD)

(d) Water Temperature Control Weir. A water temperature control weir constructed of rolled earth is located 400 feet upstream of the centerline of the concrete portion of the dam. The crest elevation of the weir is 580.0 feet NGVD and is approximately 780 feet in length.

(2) Re-regulation Dam. The Re-regulation dam is located 9.5 miles downstream from the main dam and consists of a compacted earth embankment, a gated concrete spillway, a sluice and an operating house. The total length of the dam is 1,550 feet.

(a) Earth Embankment. The crest elevation of the compacted earth embankment is 537.0 feet NGVD. The embankment is 1430 feet in length.

(b) Spillway. The concrete spillway is 119.5 feet in length. The spillway is topped by two 32 by 31 foot-high tainter gates separated by an 8 foot wide pier. The spillway crest elevation is 499.0 feet NGVD. A 68 foot by 40 foot stilling basin with an end wall is provided for the purpose of energy dissipation. The stilling basin floor is at elevation 494.0 feet NGVD. The operating house is located at the west end of the spillway.

(3) Saddle Dams. Two small saddle dams are located just north of the entrance to the Frank Russell Recreation Area.

## 2.03 LAKE REGULATION

a. General Objective. The objective for regulating the Clarence Cannon Dam is to provide flood control, hydroelectric power generation, water supply, minimum releases for downstream water quality control, water temperature control for fish and wildlife, and recreation. There are also incidental benefits to Mississippi River navigation. The pool at elevation 606.0 feet NGVD retains one hundred percent of the joint-use storage for the other project purposes, namely hydroelectric power generation, water supply, water quality, recreation, and fish and wildlife enhancement and has one hundred percent of the flood-control pool for floodwater storage available. Figure 2-1 shows the duration of the pool elevation for the period of record, while Figure 2-2 shows the frequency curve using the annual peak lake elevations. The curve was created using Weibull plotting positions.

b. Reservoir Regulation and Hydroelectric Power Generation. Normal drawdown of the conservation pool resulting from power production will be limited throughout the year, with a more significant limitation during the crop season. The Southwestern Power Administration (SWPA), Department of Energy, schedules hydropower generation in cooperation with water control managers in the St. Louis District. The various levels of pool storage within Mark Twain Lake are defined below. Figure 2-3 shows the water control regulation diagram for the different pool elevations.

## Mark Twain Lake Master Plan

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(1) The controlling release (i.e. maximum) release rate from the Re-regulation Pool is 12,000 cfs (cubic feet per second) during the dormant season (i.e. October through March), while the minimum release, at all times, is 50 cfs.

(2) During the crop season, the release rate from the Re-regulation Pool will normally vary between 50 cfs and 6,000 cfs. However, the release rate from the Main Dam may be as high as 12,000 cfs if the Mark Twain pool elevation is at or above 615.0 feet NGVD. The nature of hydroelectric power generation is such that the release rate from Cannon Dam will normally vary between 0 cfs and 12,000 cfs.

**Figure 2-1**

FREQUENCY AND DURATION OF DAILY OBSERVED STAGE  
SALT RIVER AT MARK TWAIN LAKE  
COMPUTED OVER YEARS 1984 TO 2001 BETWEEN DAYS 01JAN AND 31DEC

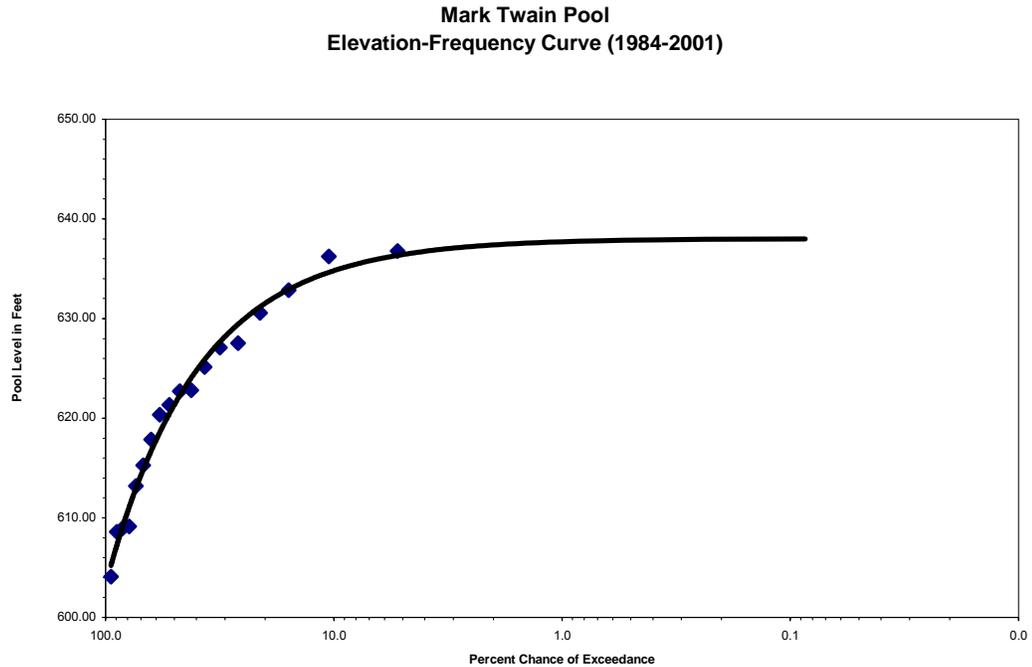
Level	Duration	Percent	Level	Duration	Percent
637	0	0.00	615	742	11.30
636	7	0.10	614	875	13.30
635	12	0.20	613	1008	15.30
634	24	0.40	612	1142	17.40
633	43	0.70	611	1287	19.60
632	55	0.80	610	1462	22.20
631	68	1.00	609	1671	25.40
630	90	1.40	608	1954	29.70
629	113	1.70	607	2447	37.20
628	129	2.00	606	3085	46.90
627	149	2.30	605	3584	54.50
626	174	2.60	604	4018	61.10
625	206	3.10	603	4400	66.90
624	252	3.80	602	4832	73.50
623	306	4.70	601	5396	82.10
622	348	5.30	600	5757	87.60
621	387	5.90	599	6029	91.70
620	421	6.40	598	6384	97.10
619	461	7.00	597	6474	98.50
618	514	7.80	596	6555	99.70
617	568	8.60		6573	100.00
616	629	9.60			

NOTE: 2 values (0.0%) missing from 6575 values in time interval

(a) The maximum release will be restricted to 2,000 cfs if the stage of the Mississippi River at Louisiana or at St. Louis is forecast to be at flood stage and the Mississippi River hydrograph is not on its recession side.

(b) In an attempt to prevent the Mark Twain Lake pool elevation from reaching 615.0 feet NGVD, which would automatically require a change in the maximum release to 12,000 cfs, the maximum release may be increased to 10,000 cfs under either of the conditions given below.

**FIGURE 2-2**



1. If the pool elevation is forecast to rise to 615.0 feet NGVD, it may be determined to increase the release up to 10,000 cfs after consultation with local downstream interests.

2. If the flood event is over and if favorable weather and river forecast conditions exist, the decision may be made to increase the release to 10,000 cfs after consultation with local downstream interests.

3. Every year, the Missouri Department of Conservation notifies the Corps of Engineers when the fish spawn begins. If conditions are favorable, the pool elevation of the lake will be monitored and controlled to minimize the amount of fluctuation. Ideally the pool is stabilized from 1 May to 15 June to enhance the fish spawn. For an example of this operation, see Figure 2-4.

FIGURE 2-3

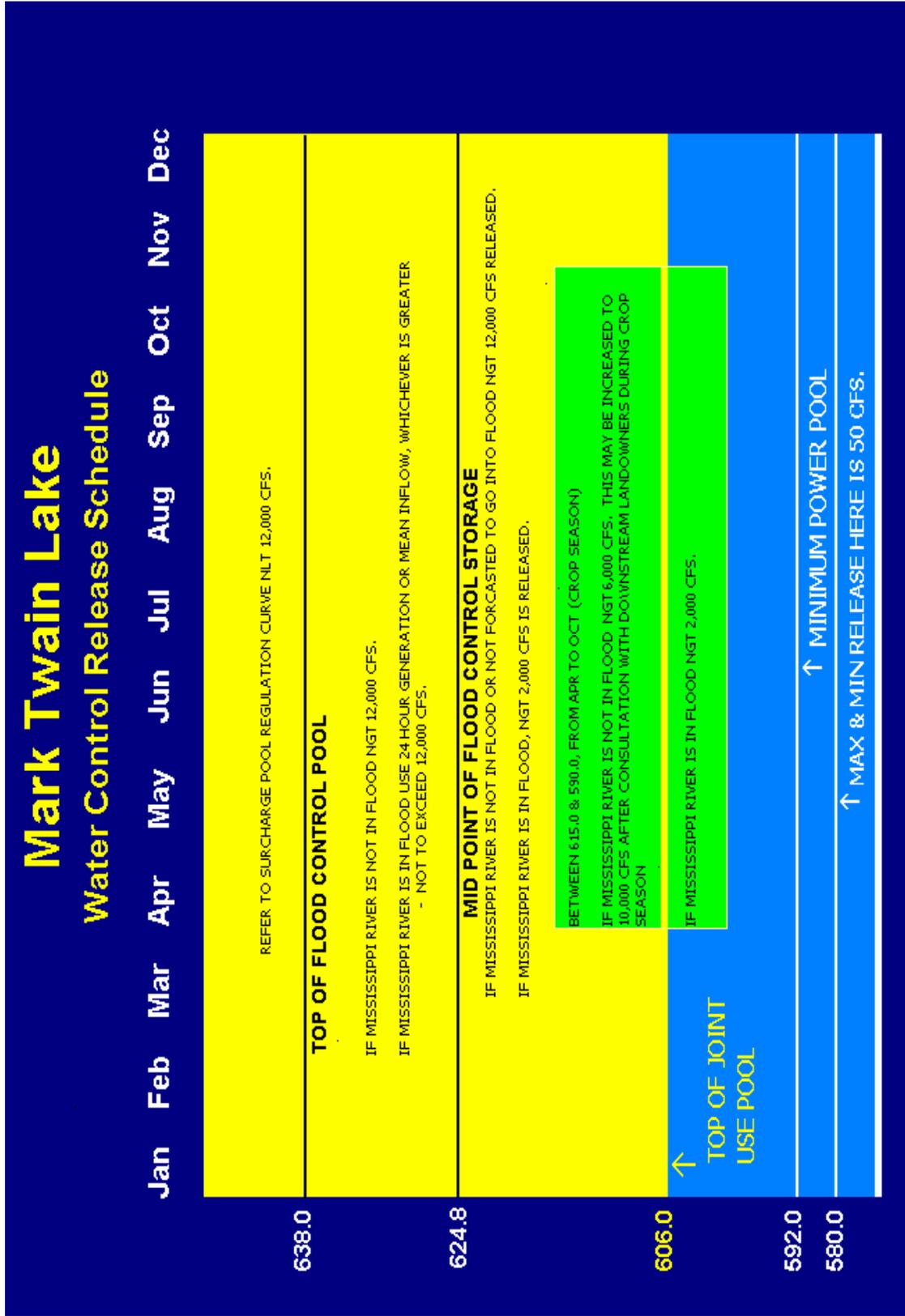
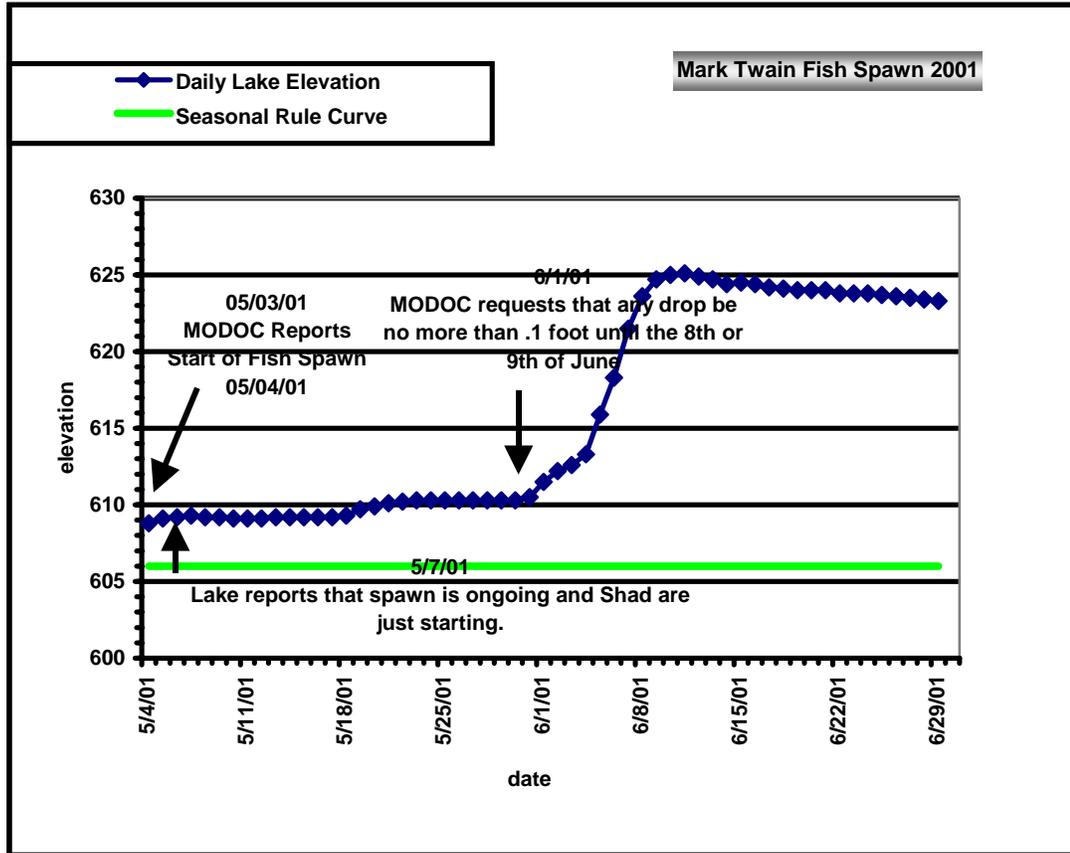


FIGURE 2-4



MARK TWAIN LAKE WATER CONTROL VARIOUS POOLS DEFINITION

**Inactive Pool** (520-567.2 feet NGVD): 87,000 Acre-ft. Storage used to accommodate the effect of sedimentation in the lake.

**Conservation Pool** (567.2 – 606.0 feet NGVD): 457,000 Acre-ft. Storage used to provide for hydropower, water supply (20,000 Acre-ft.), fish and wildlife conservation, recreation, water quality enhancement, and incidental navigation on the Mississippi River.

**Hydroelectric Pool** (592.0-606.0 feet NGVD): No set storage allocation. This is a subset of the conservation pool and is defined solely by elevation.

**Flood Control Pool (lower)** (606.0 – 624.8 feet NGVD): 442,000 acre-ft (3.58 inches of runoff). Storage set aside to provide flood damage reduction on the lower Salt River and the Upper Mississippi River.

**Flood Control Pool (upper)** (624.8 – 638.0 feet NGVD): 442,000 acre-ft (3.58 inches of runoff). Storage set aside to provide flood damage reduction on the lower Salt River and the Upper Mississippi River.

**Induced Surchage Pool** (638.0 –642.0): 164,700 acre-ft (1.33 inches of runoff). This is a subset of the entire surcharge pool. Storage set aside to allow discharge to increase up to inflow or spillway capacity (gates out of the water).

**Surchage Pool** (638.0 – 648.0): 433,800 acre-ft (3.51 inches of runoff). After the induced surcharge pool has been used this storage passes the spillway design flood (Peak inflow = 476,000 cfs, peak outflow 276,500 cfs).

**Freeboard** (648.0 –653.0): 257,120 acre-ft (2.08 inches of runoff). The storage needed to prevent wave wash from overtopping the dam.

c. **Water Quality Regulation.** A minimum release of approximately 50 cfs will be maintained at all times through the Re-regulation Dam, regardless of the Mark Twain Lake pool elevation, to ensure satisfactory downstream water quality conditions.

d. **Flood Control and Hydropower Interface.**

Flood Control. The objective is to provide a high degree of protection for areas along the Salt River and the Mississippi River downstream of the project. The two components of this project (Cannon Dam and the Re-regulation Dam) will be regulated as one project. The average releases from the flood control pool will normally vary between 2,000 and 12,000 cfs. The release depends upon the pool elevation of Mark Twain Lake, the inflow rate, the downstream runoff, the stages on the Lower Salt River and on Spencer Creek, and the stages on the Mississippi River at Louisiana and at St. Louis. However, the release may be temporarily reduced to 50 cfs in the event of an emergency or other unusual condition. An unusual condition may include threats to the safety of human life or to the integrity of the project, inspection and maintenance of the project, or maintaining a constant pool elevation during fish spawning season. When the pool elevation is above 606.0 feet, the portion of the flood release that can be used for power generation will be passed through the penstocks and the remainder of the release will be passed through the spillway.

During the growing season (i.e., April through October), the flood release will normally be 6,000 cfs or less until elevation 615.0 is exceeded. When practical, the growing season shall be considered to be in effect when a significant amount of crops are in the field as determined by consultation with local farming interests. Releases may be restricted because of the flooding on the Lower Salt River or on the Mississippi River at Louisiana or at St. Louis.

A limited amount of storage, approximately 1510 dsf (day-second-feet or daily average of cfs), is provided in the Re-regulation Pool between elevations 521.0 feet and 528.0 feet. This storage is used to attenuate releases from Mark

Twain Lake, to store releases from Mark Twain Lake for pumpback operations, and to provide water quality releases. Operation of the Re-regulation Dam must be coordinated closely with Mark Twain Lake releases and with local inflow to the Re-regulation Pool. The outflow from the Re-regulation Pool does not need to be maintained at a constant rate.

Hydroelectric power. The objective is to obtain the maximum amount of power generation revenue the project is capable of producing without conflicting with the achievement of other project purposes. When within the conservation pool, hydroelectric power will be scheduled so as to meet the needs of SWPA. Normal lake drawdown within the conservation pool as the result of power production will be limited to 2.0 feet per calendar week (i.e., Sunday through Saturday) or 4.0 feet per month (i.e., any consecutive four calendar week period) during May through October. During the remainder of the year, normal lake drawdown will be limited to 2.0 feet per week with no monthly maximum. Care will be taken to meet the power needs of SWPA everyday, but final control always rests with the Regulating Office. Cannon Dam Power Plant was designed to produce 58,000 KW of electrical power (installed capacity) as a peaking plant.

#### 2.04 VISITATION DATA.

a. General. Visitation at the Clarence Cannon Dam and Mark Twain Lake project has been estimated since 1984 by the use of traffic counters and statistical analysis based on visitor use surveys. Visitation was estimated in recreation days until 1991. Then, the Visitor Estimation Reporting System (VERS) was installed at the lake project to administer visitation reporting. Two of the important units of measurement in VERS are visitor hours and visits.

Visitor hours represent the presence of one or more persons recreating on land or water for periods of time aggregating to sixty minutes. It takes into consideration the number of participants and duration of stay and provides a good estimate of the amount of use.

Visits are simply a 'head count' of visitors to a project or recreation area but do not reflect the amount of use or length of stay. It represents the entry of one person into a recreation area or site to carry on one or more recreation activities.

A recreation day is similar to a visit but reflects the duration of the visit in days. It is the unit of measure for determining recreation benefits at water resource development projects, but has not been officially used by the Corps since 1991.

b. Past and Current Visitation. Visitation to Clarence Cannon Dam and Mark Twain Lake increased dramatically until the late 1980s, when it began to level off around 2 million recreation use days. Visitation increased from 665,000 in

## Mark Twain Lake Master Plan

1984 to over 2 million in 1988. The lowest visitation years of 1993 and 1998 for Mark Twain Lake reflect the impacts of high water events. Visitation has rebounded since 1998 to set a new record in 2002 with almost 2,600,000 visitors, a reflection of favorable recreation seasons.

**TABLE 2-1**

**CLARENCE CANNON DAM AND MARK TWAIN LAKE ACTUAL VISITATION DATA, 1976 - 2002**

Year	Visits	Rec-Use Days	Visitor Hours
1976		220,536	
1977		146,023	
1978		295,021	
1979		229,300	
1980		215,171	
1981		139,741	
1982		258,057	
1983		424,339	
1984		□ 665,577	
1985		850,700	
1986		1,684,372	
1987		1,863,104	
1988		2,030,000	
1989		1,865,980	
1990	1,834,157	1,738,052	
1991	1,849,844	1,814,947	
1992	1,648,429	1,638,246	19,586,956
1993	1,423,489	1,352,581	◇16,230,968
1994	1,696,376	1,567,938	18,815,259
1995	1,685,983	1,602,029	19,224,351
1996	1,636,607	1,516,801	18,201,614
1997	1,664,087	1,466,293	17,595,516
1998	1,218,199	1,111,057	13,332,681
1999	1,794,386	2,200,366	26,404,389
2000	1,836,028	1,877,135	22,525,623
2001	1,806,966	2,116,511	25,398,112
2002	2,594,626	2,306,286	27,675,436

□ Note: Clarence Cannon Dam was completed in 1983 and Mark Twain Lake reached recreational pool in March of 1984. The 1984 visitation data represents the first full year of lake recreational use at the project

◇ Missing September visitation

Yearly visitation totals are affected by a number of factors including changes in weather conditions, fluctuations in lake levels, cost and supply of gasoline, general economic conditions, and the availability of recreational facilities at the lake. TABLE 2-1 presents a summary of actual visitation from 1976 -2002. TABLE 2-2 presents the percentage of users traveling from various mileage distances to the major recreation areas at Mark Twain Lake. This information is from a 1988 recreation area user survey. The project zone of influence is considered to extend 125 miles from the lake.

**TABLE 2-2  
DISTANCE OF VISITOR TRAVELS TO MAJOR RECREATION AREAS  
AT MARK TWAIN LAKE**

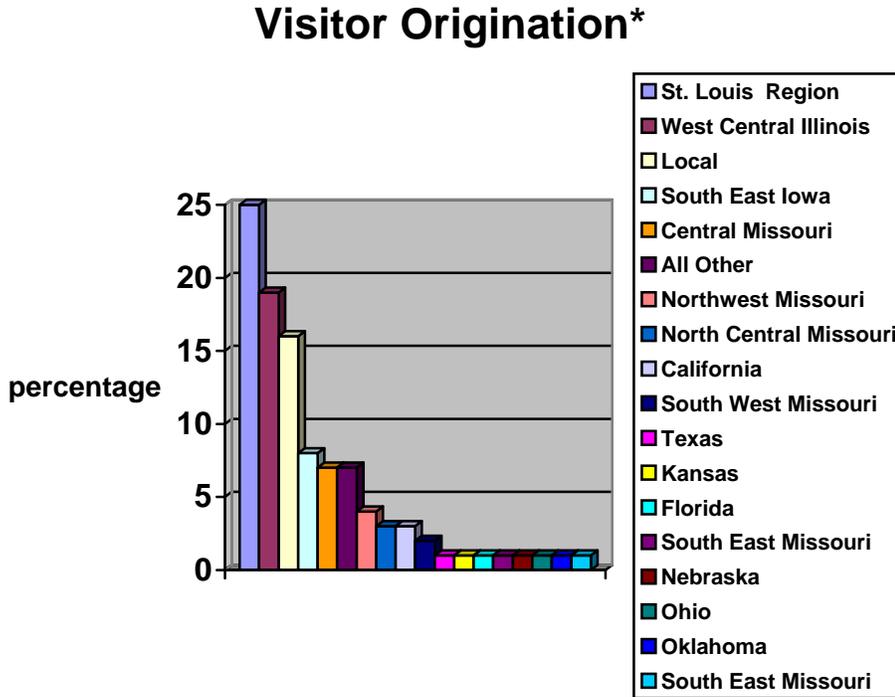
Area	Within 50 Miles	51-125 Miles w/o St. Louis	St. Louis Area	Other
M.W. Boudreaux	14.60%	13.30%	38.60%	33.50%
Ray Behrens	23.20%	6.30%	48.20%	22.30%
Robert Allen	45.50%	0	36.40%	18.10%
South Fork	71.50%	7.10%	14.30%	7.10%
Stoutsville	11.10%	22.20%	50%	16.70%
Indian Creek	28.60%	7.10%	29.40%	34.90%
John Spalding Day Use Boat Ramp	33.80%	8%	30.80%	27.40%
Spillway North & Overlook	28.20%	13%	22.60%	36.20%
Bluff View	57.10%	4.80%	9.50%	28.60%

c. Projected visitation. A discussion of projected visitation at Mark Twain Lake is presented in Section 6.12.

Figures 2-5 to 2-7 below were created by sampling visitor logs and camper registrations. Additional information was obtained from a study performed by the University of Missouri for the Northeast region of Missouri. Visitors originate from the St. Louis area, West Central Illinois, and Southeast

Iowa. By state, Missouri (78 percent) and Illinois (13 percent) are the points of origin for most campers.

Figure 2-5



\*Based on informal sampling of Boudreaux Visitor Center 2001 visitor logs.

Figure 2-6

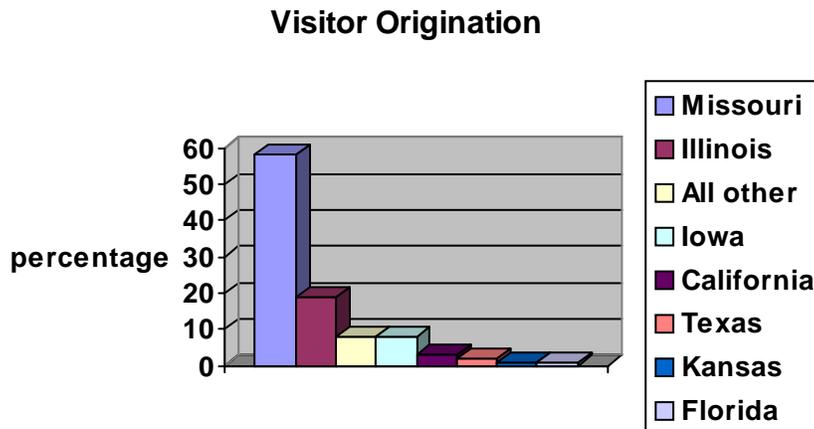
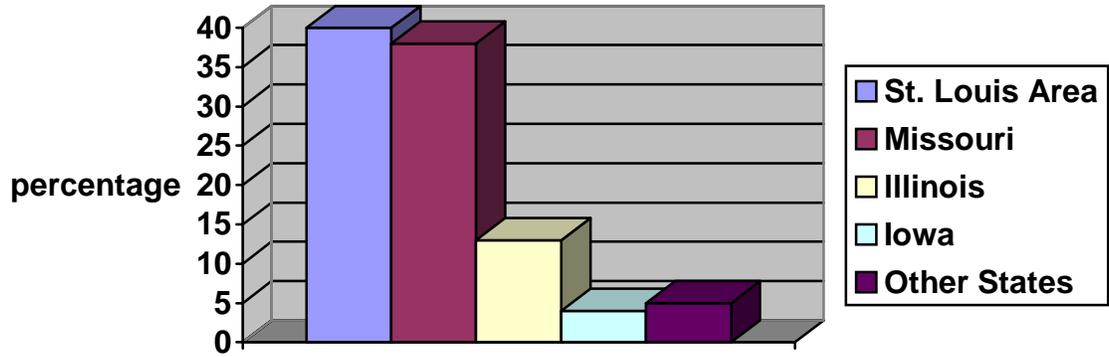


FIGURE 2-7

### Camper Originations\*



\*Based on informal sampling of 2001 camper registrations.

## SECTION III - OPERATING PROJECTS: STATUS

### 3.01 PROJECT DEVELOPMENT AND OPERATION CHRONOLOGY

Clarence Cannon Dam and Mark Twain Lake were authorized by the Flood Control Act of 23 October 1962, Public Law 87-874. Construction began in 1966, and the lake was impounded in the spring of 1984. The hydropower plant in the main dam began on-line generation in the late fall of 1984.

### 3.02 CHRONOLOGY OF EXPENDITURES FOR PUBLIC USE AND ENVIRONMENTAL RESOURCE DEVELOPMENT

#### a. Federal Government.

##### (1) Recreation Area Development

Thirteen public recreation areas have been developed by the St. Louis District Corps of Engineers. Ten of these areas have been developed for intensive recreation and are named as follows: M.W. Boudreaux Recreation Area, Ray Behrens Recreation Area, Robert Allen Recreation Area, South Fork Recreation Area, Stoutsville Recreation Area, Indian Creek Recreation Area, John F. Spalding Recreation Area, Frank Russell Recreation Area, Warren G. See Spillway Recreation Area and Bluffview Recreation Area. Three additional areas, North Fork, Sandy Creek and Shell Branch Recreation Areas have limited facility development, with large portions of each reserved for future recreational development. In addition, the St. Louis District has partially developed two other areas that were included in the Mark Twain State Park lease issued to the Missouri Department of Natural Resources in 1986.

The scope of development varies with each respective area. Some areas provide basic facilities such as access roads, picnic tables, comfort stations and launch ramps with related parking, while other areas provide a swimming beach, campsites with electrical hookups, showerhouses, playgrounds, amphitheaters, and nature trails. The total cost of recreational and environmental developments for the recreational areas was \$21,916,515. This total was spent for initial development and construction of three major camping areas, eight major picnic areas, fourteen boat ramps, and approximately 34 miles of paved roadways. These facilities were opened for public use during the period 1979 through 1986.

The St. Louis District will provide additional facilities as proposed in this master plan subject to public demand and availability of funds. Table 3-1 summarizes existing recreational facilities at areas managed by the Corps of Engineers, those leased to the state of Missouri at Clarence Cannon Dam and Mark Twain Lake, and those operated on State Park lands adjacent to Corps property.

### (2) Operation and Maintenance Cost

Operations expenditures for the period 1 October 2000 through 30 September 2001 (Fiscal Year 2001) amounted to \$2,906,047. Maintenance expenditures for the same period were \$2,646,945 for a total operation and maintenance cost of \$5,552,992.

#### b. Non-Federal Public Agencies

An area comprising 1,559 acres of land is outgranted to the Missouri Department of Natural Resources (MDNR). A 25-year lease (DACW43-1-86-6) ending 28 February 2010, authorizes the MDNR use and occupancy of 1,559 acres of land along the north and south shorelines of the main pool and along the south shore of the South Fork of the Salt River. The MDNR, formerly the Missouri State Park Board, had a large land holding along the Salt River before acquisition began. Six hundred and seven acres (607) of Government land were exchanged for 617 acres of MDNR's fee land and 17 acres of flowage easements. The 617 acres of land acquired by the Government from MDNR lie mainly in the pool area with some portions lying above 606.0 NGVD being included in the park lease. The land area of the lease is 1,559 acres as the premises was surveyed using a 606.0 NGVD elevation line, which is the top of the conservation pool. The terms of the lease allow for access to the water's edge if the pool should fall below the 606.0 elevation. Developed areas of Mark Twain State Park lie both on MDNR fee land and on the leased premises. Access to the park is by Missouri State Highway 107, which crosses portions of the park on a northwest southeast axis, and State Route U, which crosses parts of the park on an east/west axis. Existing development on leased land consists of an arterial road system, a swimming beach, a bathhouse, 10 picnic sites, two 4-lane boat ramps, one single-lane boat ramp, an overlook, 235 car parking spaces, 165 car/trailer parking spaces, 2 vault comfort stations, a group camp facility with swimming facility, and a land irrigation sewage treatment plant (STP).

#### c. Private Recreational Investment

(1) Concession Leases. There are two commercial concession leases at Clarence Cannon Dam and Mark Twain Lake. The leases occupy portions of two Corps developed public recreation areas. A summary of a feasibility study entitled "*Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake, Missouri*", completed in January 2001 that addressed marina capacities, expansion possibilities and a potential third marina, is located in Appendix B.

Descriptions of the commercial concession lease areas are provided below:

(a) Blackjack Marina (Blackjack Marina, Inc., Lessee) comprises approximately 24.0 acres of land. The total leased area is 37.5 acres, which includes approximately 13.5 acres of water in the conservation pool. The area is located in the southern portion of the Ray Behrens Recreation Area approximately two miles southwest of the main dam. The concession lies entirely on Government land and includes a total of 275 boat slips (total includes every slip including courtesy boat slips); a sales and service building, and a floating gas dock/store. Services, boat rentals and hunting and fishing licenses are available for sale to the public. The facility began operation in 1985. Proposed additional facilities include overnight accommodations, dock and slip expansion and supplemental parking when the present facilities approach capacity. Lease No. DACW43-1-84-6 covering the site expires on 31 October 2008.

(b) Indian Creek Marina (Indian Creek Development Corporation Lessee) comprises approximately 97.4 acres of land. The total leased area is 154.64 acres, which includes approximately 57.2 acres of water in the conservation pool. The area is located in the southwestern portion of the Indian Creek peninsula and lies entirely on Government land. The marina began operation in 1986. Existing facilities include a total of 221 boat slips (total includes rental slips, courtesy slips, etc), primary electrical service, a storage building, a general store, a restaurant, and gas pumps. Access roads and 200 parking spaces exist on the site. Proposed facilities may include overnight accommodations. Lease No. DACW43-1-84-63 covering the site expires 29 May 2014.

(c) Mark Twain State Park Although the State has indicated that a “third commercial concession area” is no longer an element in their short-term or long-term planning, this is an excellent location for a third commercial concession area. A January 2001 feasibility study entitled *Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake, Missouri* prepared by Parsons HBA for the Corps stated that under the present circumstances, development of a quality resort lodge/hotel with a restaurant and ancillary facilities is a higher priority than developing a third marina. The potential at this location is excellent because of compatible existing facilities and good access from major highways as stated in Appendix D, page D-16 of the market feasibility report. A summary of the study is included in Appendix B of this Master Plan.

d. Summary of Recreation Facilities

Table 3-1 presents a listing of all existing recreational facilities that have been provided at Clarence Cannon Dam and Mark Twain Lake by the Corps of Engineers, the State of Missouri, and private concessionaires.

# Mark Twain Lake Master Plan

TABLE 3-1  
OPERATING PROJECTS: MARK TWAIN LAKE  
STATUS: EXISTING PUBLIC RECREATIONAL DEVELOPMENT

AREA	Campsite Full Hookup	Camp Sites W/Elec.	Camp Sites Primitive	Group Camp Sites	Trailer Dump Station	Shower Building	Comfort Station	Comfort Vault	Picnic Sites	Picnic Shelter	Swim Beach	Fish Cleaning Stations	Fountains/ Hydrants	Boat Ramp Launch Lanes	Play Ground	Bath House	Amphitheater	Corral	High Water Ramp	Multi-Purpose Building	Visitor Center Interpretive Exhibits	Marina	Shooting Range	Change House
M.W. Boudreaux Recreation Area							1		14												1			
John C. "Jack" Briscoe				20		1				1			2		1									
Ray Behrens	7	165			1	4	5		15	1		1	10	4	4		1						1	
Robert Allen								1	3					4					1					
South Fork								1	3					4										
Stoutsville								1	3			1		4					1					
North Fork														4										
Shell Branch														4										
Sandy Creek																								
Indian Creek	13	190	20	*37	2	6	7	3	13	2	1	2	19	5	4		1		1				1	
John Spalding							3		33	3	1	1	4	4	1	1			1					
Frank Russell		65			1	1		3					3		2		1	1						
Spillway								4		2			7	2	2					1	1		1	
Bluff View								2	4	1				1	1									
Hunter/ Fisherman Lots (36)			6					1	2					9										
Corps Total	20	420	26	57	4	12	16	16	90	10	2	5	45	45	15	1	3	1	4	1	2	2	1	
State Park Facilities **		63	40	4****	1	2	0	7	30	1	2****	1	13	9	1		1			1	1			1
Grand Total	20	483	66	61	5	14	16	23	120	11	4	6	58	54	16	1	4	1	4	2	3	2	1	1

\* Twelve of these sites are tent only sites. Twenty-five of these sites are trailer sites with electric.

\*\* State Park facilities listing are for both State Park owned lands and leased properties.

\*\*\* Facilities include 1 Swim Beach and 1 Swimming Facility

\*\*\*\* Four cabins and a dining hall



## SECTION IV - COORDINATION WITH OTHER AGENCIES AND THE PUBLIC

### 4.01 GENERAL

A high degree of coordination was maintained with all appropriate Federal and State agencies during preparation of the original Master Plan and in the preparation of subsequent updates to the Master Plan. For this reason, a summary of agency coordination during project development and the ensuing 19 years of agency and public coordination and cooperation is contained in the following paragraphs. Detailed coordination activities are presented in the Operational Management Plan (OMP) under separate cover.

### 4.02 FEDERAL AGENCIES

#### a. National Park Service

The National Park Service reviewed the proposals for development contained in the original Master Plan. Their comments were coordinated with the Missouri State Park Board (now MDNR) and were given full consideration in the development of the Master Plan and recreation facilities.

#### b. U.S. Fish and Wildlife Service

During the early stages of project planning, the USFWS and the Corps were in frequent contact to coordinate their respective programs for fish and wildlife resources at Mark Twain Lake. Initial coordination called for a license agreement between the Corps and the MDC for wildlife management on approximately 14,000 acres of land. In 1978 the MDC declined to enter into a cooperative agreement at Mark Twain Lake. The Corps of Engineers has assumed responsibility for the wildlife management of these and other lands. Cooperation between the Corps and the USFWS is continuing with the recent North American Waterfowl Cooperative Agreement between the Department of Interior and Department of the Army.

#### c. Public Health Service

The Public Health Service prepared a report and recommendations concerning vector-borne diseases at the time of lake construction. Many of these recommendations are now considered obsolete in the light of current environmental concerns and knowledge.

In Missouri, diseases such as St. Louis and eastern equine encephalitis are a potential threat each year, but the much-publicized West Nile encephalitis has overshadowed them recently. West Nile virus (WNV) was first discovered in the United States in New York City in 1999 and spread to other states in the

Northeast and along the Atlantic seaboard during 2000. WNV invaded the Midwest in 2001, and by the fall of that year had been identified in eight crows in eastern Missouri. One positive WNV case was reported for Monroe Co. in 2002.

The Centers for Disease Control and Prevention is working with the U.S. Geological Survey, U.S. Department of Agriculture Animal and Plant Health Inspection Service, state wildlife agencies, and state and local health and vector control agencies to track the occurrence of WNV. Organizations in the lower 48 States and localities are actively participating in a WNV Surveillance System.

The WNV Surveillance System is intended to monitor the geographic and temporal spread of WNV over the contiguous United States, to further develop national public health strategies for WNV surveillance, prevention, and control; to develop a more complete regional picture of the geographic distribution and incidence of similar viruses; and to provide national and regional information to public health officials, elected government officials, and the public.

d. Natural Resources Conservation Service (NRCS)

The Corps maintains continuing coordination with the NRCS concerning agricultural management programs on public land. The NRCS also provides information regarding cooperative plans, tillage techniques, agricultural leases and pond construction, design, and location. This information is used as a basis for planning purposes by the NRCS for proposed projects in the upper watershed and by the Corps for water quality concerns.

The NRCS, in association with the MDC, sponsor Wetland Reserve Program projects on flowage easement lands. Both agencies have a vested interest in management and identification of wetlands. The NRCS has an interest in the policies and procedures used by the Corps to interpret and administer Section 404 of the Clean Water Act of 1972. The Corps has an interest in how the NRCS administers wetlands through the 1985 Food Security Act. Both agencies work together to effectively meet their goals.

e. Federal Power Commission

The study to determine the feasibility of generating hydroelectric power as one of the multiple purposes of Mark Twain Lake was coordinated with the Chicago Regional Engineer of the Federal Power Commission.

f. Southwestern Power Administration (SWPA)

The Southwestern Power Administration was originally consulted regarding the financial feasibility of power generation at Mark Twain Lake. They later became the contracted buyer of the generated electricity. Contractual and administrative coordination is on going and will continue with Southwestern Power Administration.

g. Advisory Council on Historic Preservation

The Advisory Council on Historic Preservation is a division of the Executive Office and serves in an advisory capacity to the President. The Advisory Council reviews and comments on federal agencies' findings of "adverse effect" or "no adverse effect" to cultural properties for construction, operation, and maintenance projects. The Advisory Council also comments and provides guidance on federal agencies' proposals to avoid or mitigate adverse effects.

4.03 STATE OF MISSOURI

Close liaison with the MDC, Missouri Department of Natural Resources and Missouri Department of Transportation was maintained through the planning and early development phases of Clarence Cannon Dam and Mark Twain Lake.

a. Missouri Department of Natural Resources (MDNR)

The MDNR includes the following divisions; State Parks; Outreach and Assistance; Water Protection and Soil Conservation; Air and Land Protection; and Geologic Survey and Resource Assessment. The Corps of Engineers has a 25-year lease with Missouri State Parks for approximately 1,559 acres of outgranted State Park lands near Florida, Missouri. The Corps works closely with the Mark Twain State Park in future planning, maintenance and monitoring visitation.

(1) State Historic Preservation Office (SHPO) Coordination is also maintained with this agency, which is within MDNR. The SHPO provides information and guidance regarding the protection and preservation of cultural resources and assists in making determinations of cultural resources eligibility for inclusion in the National Register of Historic Places.

(2) The Corps coordinates with the MDNR regarding the construction and operation of wastewater treatment facilities, the maintenance of effluents (NPDES and Operating permits), drinking water and clean water quality standards.

(3) The Corps of Engineers also works with the MDNR concerning lake and watershed water quality, monitoring of sewage and solid waste disposal and coordination of raw water for municipal use.

b. Missouri Department of Conservation (MDC)

This agency has the formal responsibility of fisheries management for Mark Twain Lake and the re-regulation pool. Informally the Corps of Engineers coordinates management objectives with the MDC concerning enforcement,

## **Mark Twain Lake Master Plan**

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fisheries management, endangered species, raptor reintroduction programs, forestry, and prairie restoration and management.

(1) An Agreement between the U.S. Army Corps of Engineers and the MDC allows the Corps to conduct authorized deer and turkey hunts within Corps recreation areas during established hunting seasons. These hunts are conducted for physically challenged hunters.

(2) MDC has a cooperative effort with the Corps to develop littoral zone structures in Mark Twain Lake.

### (3) Hunter Education Programs

The Education Program, sponsored by the MDC is to provide hunter education instruction to all citizens. Corps Rangers and MDC personnel cooperatively provide hunter safety and ethics training to the general public. The Corps provides a classroom, shooting facilities, and teachers to work cooperatively with MDC personnel in providing training and live firing to the general public.

### (4) Shooting Range Inspections

MDC personnel inspect the shooting range in the Warren G. See South Spillway area and prepare an annual report evaluating the safety conditions of the range.

### (5) Archery Range

MDC and Corps personnel will develop the plans for an archery range in the Ray Behrens Day Use Area. These plans will be used for the construction of the range.

### c. Missouri Department of Transportation

Coordination is on going concerning signs, maintenance of right-of-way, encroachments and potential future transportation system upgrades for the area.

### d. Missouri Highway Patrol

This agency provides support that includes traffic control, law enforcement, accident investigation and reporting, and emergency response. A Memorandum of Agreement is in place with these agencies and the Missouri Division of Highway Safety, St. Louis, Little Rock, Memphis, Rock Island, and Kansas City Districts of the Corps of Engineers. This partnership provides a mutually beneficial opportunity for each agency to improve the effectiveness of their safety education/awareness programs through such initiatives as the safety billboards across Missouri. These collaborative safety campaigns are

designed to address visitor inquiry and accidents. Examples include highway billboards and driver checkpoints.

e. Missouri Water Patrol

This agency provides support that includes boat inspections, enforcement of state laws, boat safety courses, and search and rescue operations. The Missouri Water Patrol also participates in the Memorandum of Agreement with the Missouri Highway Patrol to improve effectiveness of safety education/awareness programs.

f. Missouri Department of Public Safety/Motorcycle Safety Foundation

The Motorcycle Safety Foundation is administered through the Missouri Department of Public Safety, Division of Highway Safety. The Foundation is planning to provide motorcycle safety and operation training programs at Mark Twain Lake for the public and employees.

g. Challenge Partnership with the MDC, National Rifle Association Foundation Inc.

This agreement provided for the construction of the David C. Berti Shooting Range in the Warren G. See South Spillway Area for hunter education training and the enjoyment of visitors. It ensured the availability of safe multi-use opportunities on public lands.

#### 4.04 NATIVE AMERICAN TRIBES

Beginning in October 1999, St. Louis District began consulting with 21 federally recognized tribes regarding cultural resource issues at Mark Twain Lake. The tribes are the Choctaw Nation; Hannahville Indian Community; Ho-Chunk Nation; Iowa Tribe of Kansas; Iowa Tribe of Oklahoma; Kickapoo Tribe of Oklahoma; The Kickapoo Traditional Tribe of Texas; Kickapoo Tribe of Kansas; Miami Tribe; Osage Nation; Citizen Potawatomi Nation; Forest County Potawatomi; Pokagon Band of Potawatomi; Huron Potawatomi Nation; Prairie Band of Potawatomi; Gun Lake Potawatomi; The Peoria Tribe; Sac & Fox Nation of Oklahoma; Sac & Fox Tribe of Iowa; Sac & Fox Nation of Kansas; and Winnebago Tribe. These tribes, as mandated by the National Historic Preservation Act of 1966 (as amended), Executive Order 13007, the American Indian Religious Freedom Act of 1978, and the Native American Graves Protection and Repatriation Act must be consulted regarding potential adverse effects on sites that are of cultural or religious importance to them or that involve human remains and funerary objects. St. Louis District is in regular contact with these tribes regarding any issues that might be of interest to them.

### 4.05 LOCAL AGENCIES

There has been and continues to be a great deal of coordination between the Corps of Engineers and local agencies. Coordination includes information on future plans, advisement of changes in policies and regulations, exchange of information and cooperation on special events, recreation and volunteer programs.

The Corps cooperates with several local primary agencies and organizations: Ralls and Monroe County Courts and Sheriff's Departments, Clarence Cannon Wholesale Water District, Ralls County Electric Cooperative, Northeast Power Cooperative, Tri-Cities Chamber of Commerce, Mark Twain Lake Chamber of Commerce, and the Lower Salt River Basin Coalition.

#### a. Challenge Partnership Agreements

##### Challenge Partnership Agreements with Tri-City Commission

Two agreements have been instituted. One agreement includes installation of a non-discharge wastewater infiltrator system in the Warren G. See South Spillway Recreation Area. The Commission is interested in promoting and assisting the Government in providing this sanitation system for the public's benefit and use during Special events.

Another agreement resulted in construction of a picnic shelter in the Warren G. See South Spillway Recreation Area. This facility provides support and safety features for events held in this area.

##### Challenge Partnership with the Missouri Equine Council

This partnership resulted in the construction and maintenance of multi-use trails and a trail extension at Mark Twain Lake.

##### Challenge Partnership with the Missouri Department of Conservation, National Rifle Association Foundation Inc.

This partnership provided for the construction of the David C. Berti Shooting Range in the Warren G. See South Spillway Area. The shooting range provides a safe and convenient place for public firearm enthusiasts and serves as a training facility for hunter education classes, area law enforcement and new shooters. The partnership agreement ensures that multi-use opportunities are available on public lands.

#### b. Memoranda of Agreement

##### Memorandum of Agreement with Greenlawn Saddle Club, Missouri Long Riders, Monroe County Saddle Club, N.E. Missouri Long Ears Association, and Trails Committee Missouri Equine Council (MEC)

This MOA states these organizations will purchase land for donation to the government. The purpose of this agreement is to promote responsible

stewardship of natural resources. These donations will enable the rerouting of difficult to traverse sections of the Joanna and Lick Creek multi-use trails to improve trail safety.

Memorandum of Agreement with the NEMO Chapter of the National Wild Turkey Federation, Inc. and Hannibal Vo-Tech

This agreement strives to produce an integrated approach to the management of public lands. This approach will maximize the benefits to wildlife by promoting stewardship of the natural and cultural resources at Mark Twain Lake while promoting community service and involvement.

Memorandum of Agreement with the Northeast Missouri Vietnam Veterans, Inc.

This agreement permits a memorial that honors area citizens who participated in the Vietnam conflict. The Northeast Missouri Vietnam Memorial was constructed at the M.W. Boudreaux Visitor Center.

Memorandum of Agreement with the Mark Twain Lake Chamber of Commerce

This agreement establishes a relationship of cooperation regarding issues of common interest. Furthermore, it will enable the parties to the agreement to jointly plan and carry out mutually beneficial programs, projects and activities relating to responsible enjoyment, visitor safety and environmental stewardship of Mark Twain Lake and associated public lands.

Memorandum of Agreement Customer Funding with the Jonesboro, Arkansas City Water and Light and the Southwestern Power Administration (Southwestern)

This MOA is for the rehabilitation of the power plant intake gates, bridge crane controls, service air compressors, gantry crane and generator coolers.

Cooperative Agreement with the University of Missouri

The University of Missouri will house, manage, stabilize, preserve, and provide access to archaeological collections and records generated in conjunction with Corps of Engineers' activities in the State of Missouri.

Cooperative Agreement with the North American Waterfowl Management Plan

A task force will be formed to explore potential opportunities for waterfowl habitat on corps projects.

MO Partners for Safety (MOPS)

The MO Partners for Safety (MOPS) is a partnership that began with an MOA in 1998 between all five U.S. Army Corps of Engineers Districts in Missouri, the Missouri State Water Patrol, and the Missouri State Highway Patrol. Initially, MOPS was involved in promoting a statewide "buckle-up seatbelts and life jackets" billboard campaign. Since then, cooperation has

continued to expand with these and other agencies becoming involved in discovering ways to work together to improve their education and safety awareness efforts.

c. Memoranda of Understanding

Memorandum of Understanding with the Mark Twain Water Quality Initiative

This project will show the benefits of holistic land management to improve the various environmental aspects of the Mark Twain Lake Watershed. The results of this study will benefit Mark Twain Lake, the local communities, and result in improved water quality.

Memorandum of Understanding with the Bass Anglers Sportsman Society (B.A.S.S.)

The purpose of this agreement is to establish a framework of cooperation to maintain and enhance the productivity of sport fishery resources and public fishing opportunities at U.S. Army Corps of Engineers water resource projects.

Memorandum of Understanding with the Nature Conservancy.

Provides for the Nature Conservancy to provide management and monitoring recommendations, review natural resource management plans, and monitor conditions on public lands to maximize environmental stewardship efforts.

Clarence Cannon Wholesale Water Commission

This agreement allows for the use of up to 5.5 million gallons of water per day by the commission. This water provides service for local communities in Northeast Missouri.

Memorandum of Understanding with the American Canoe Association

This agreement will leverage the use of our finite resources in the protection of resources, promotion of recreation, enhancement of visitor safety, improvement of accessibility, and attraction of additional volunteers to Corps projects.

Mark Twain Lake Water Safety Program Partnering

This program is a key element in the success of the water safety program at Mark Twain Lake and has received national recognition at the National Water Safety Congress. The cooperation of many local partners has made this effort successful: Hardees of Monroe City, Pizza Hut, Kentucky Fried Chicken, Refreshment Services Pepsi of Quincy, C&R Markets of Monroe City, Wal-Mart Inc., and Lamar Advertising. Water safety will continue to be an integral part of all programs at Mark Twain Lake.

- d. Other local partners contributing to special events.

Adventure in Astronomy

This program is offered with the academic support from local educators at Hannibal-LaGrange College. Additional contributions from high school teachers and Corps personnel have afforded local visitors the opportunity to pursue topics of interest in space and astronomy fields.

Kids Fishing Day

This program, introducing young visitors to the art of fishing, is partnered with the MDC.

MSWP Safe Boating Course

This partnership with the Corps and the Missouri State Water Patrol provides boat safety courses for the general public.

Primitive Artifacts

This special event explores the cultural heritage of the Mark Twain Lake region. Partners include the Ralls, Marion, and Northeast Missouri Archeological Society and the University of Missouri.

Water Safety Bulletin Board Contest

This water safety contest is partnered with Lamar Advertising to provide water safety campaign messages for the Mark Twain Lake area.

Salt River Folk Life Festival

This special event is partnered with the Corps, Missouri Department of Natural Resources, and the Friends of Florida to educate and promote historical living skills, entertainment and crafts of nineteenth century northeast Missouri.

Mule Days

This special event is partnered with North East Missouri Long Ears Association and the Mark Twain Lake Area Chamber of Commerce.

C.A.S.T for Kids Event

A partnership with the C.A.S.T. for Kids Organization, the Corps of Engineers, the Mark Twain Lake Bass Masters and area businesses provide physically challenged and under privileged kids the opportunity to learn about and enjoy fishing.

Environmental Education Day

This informal agreement is a joint effort by a variety of organizations to promote environmental education to area students. Partners in this event include BASF Corporation, Continental Cement, The Pillsbury Co., Al's Rental Plus, Northeast Missouri Power, MDC, C&R Supermarkets, Pace Industries, the U.S. Army Corps of Engineers, Missouri Department of

Natural Resources, Kan-Man Recycling, Northeast MO Electric Power Coop, JC Auto & Truck, MO Watershed Information Network, USFWS, NEMO National Turkey Federation, McLeod, Ralls County Electric Coop, Ralls, Monroe & Marion Co. Soil and Water Conservation District, St. Louis Science Center, and Missouri Pork Producers.

### 4.06 OTHER AGENCIES AND ORGANIZATIONS

#### Ralls and Monroe Counties

Coordination with these local governmental bodies continues to be conducted as action/plans of mutual interest and/or impacts are identified at Mark Twain Lake. A Memorandum of Understanding was developed in 1986 with the identification of county roads within the project. Cooperative agreements are also maintained with the Ralls County Sheriff's Department and the Monroe County Sheriff's Department for the provision of additional law enforcement services on Corps administered public lands. These agreements have proven to be highly successful and will be continued as funding permits. These agreements would provide a contractual mechanism to meet Homeland Security requirements for the project.

#### Perry Volunteer Fire Department

The Mark Twain Lake Project Office is a dues paying member of the Perry Volunteer Fire Department. The department helps to suppress fires at Corps owned structures, Corps visitor's property and to assist in the suppression of forest and/or brush fires that immediately threaten Corps owned structures within their jurisdiction. Continued coordination will be maintained as required.

#### Monroe City Area Fire Protection District.

The Mark Twain Lake Project Office has a cooperative agreement with this agency to suppress fires in Corps owned structures, Corps visitor's property and to assist in the suppression of forest and/or brush fires that immediately threaten Corps owned structures within their jurisdiction. Continued coordination will be maintained as required.

#### Paris Rural Fire Protection District.

The Mark Twain Lake Project Office has a cooperative agreement with this agency to suppress fires in Corps owned structures and Corps visitor's property and to assist in the suppression of forest and/or brush fires that immediately threaten Corps owned structures within their jurisdiction.

Two Marinas on Mark Twain Lake.

Indian Creek and Blackjack marinas operate and provide services to the public that may not otherwise be provided by the federal, state, and local governments.

4.07 COORDINATION

The update of the Mark Twain Lake Master Plan was coordinated with elected officials, partner agencies and organizations, and the public. A public meeting was conducted in the fall of 2001 to identify and discuss issues of concern regarding Mark Twain Lake's operation prior to initiating the update the Master Plan. The final draft plan was circulated for public review and comment in the fall of 2003.

A report entitled *Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake* was completed in January 2001. Information developed in that study is incorporated in this Master Plan and a summary is included in Appendix B.

Comments received from the public, organizations and agencies at the initiation of this study and on the final draft were considered in the development of this plan. Responses to each comment received are included in Appendix C of this plan.

## SECTION V – RECREATIONAL AND ENVIRONMENTAL RESOURCES OF THE PROJECT

### 5.01 GEOLOGIC

a. Geologic Setting. The predominant geologic structure controlling the local dip of rock strata at the project is the Lincoln Fold, a complex plunging asymmetrical anticline located in northeast Missouri. The axis of this structure trends structure results in the slight (1 to 3 degrees) northwesterly dip present in the rock strata of the project area. The project area is located in the Dissected Till Plains Section of the Central Lowlands Physiographic Province. The geologic formations occurring at the surface within the project area include Paleozoic sedimentary rocks (primarily limestones and shales) Pleistocene glacial drift, and recent alluvium. The area is characterized by low to moderate relief in the uplands with locally high relief (up to 200 feet) occurring in the bluffs along the Salt River and its tributaries. Some karst features are present in the project area, most notably, solution cavities in the limestone bluffs.

b. Geologic Formations. The stratigraphy in the area consists essentially of nearly flat-lying sedimentary strata of Mississippian and Pennsylvanian formations on the uplands. These in turn, are overlain by Pleistocene deposits of glacial till, residuum, or on the floodplains, by recent alluvium.

(1) Hannibal Formation. The oldest exposed unit is the Hannibal Formation of Early Mississippian (Kinderhookian) age. It is a bluish-green, moderately hard, sublimated shale and siltstone. The shale contains some pyritized fossils, irregular tubular markings (probably worm borings) and “Rooster Tail” markings (*Taonurus causagalli*) that are common throughout the formation. The Hannibal outcrops in the eastern portion of the project area, from approximately elevation 535 to 590 feet NGVD. The Hannibal Formation is overlain by the Chouteau Formation.

(2) Chouteau Formation. The Chouteau is a gray to “mouse-gray”, Lower Mississippian (Kinderhookian) limestone. On weathered outcrops, it generally has a light to dark brown color and earthy texture. It is generally an argillaceous dolomitic thin-bedded limestone, but occurs as a medium to coarsely crystalline, competent limestone in portions of the project area. It is a cliff-forming unit with a well developed joint and fracture system. The Chouteau contains some calsite, pyrite, marcasite, and sphalerite-lined vugs. The Chouteau outcrops in the eastern portion of the project area, from approximately elevation 590 to 620 feet NGVD. The Chouteau is overlain by the Burlington Formation.

(3) Burlington-Keokuk Formations. The Burlington and Keokuk formations are similar lithologically and are assumed to contact conformably. The contact between the Burlington and the overlying Keokuk is not characterized by any significant change in the physical properties of the rock, and they are therefore treated here as one unit. The Burlington-Keokuk Formation is a light gray, coarse to fine crystalline, middle-Mississippian (Osagean) limestone. The upper section of the unit is a cherty limestone with chert occurring in nodular form throughout. Geodes are common locally in the upper portions of the formation, and are sometimes found in the weathered residuum of the formation. Bedding planes in the upper unit are generally separated by paper-thin shale partings. The lower unit consists of approximately 20 feet of massive bedded very coarsely crystalline limestone that is practically chert free. The Burlington is extremely fossiliferous, containing an abundance of crinoids. The unit is the primary cliff-former in the project area. The thickness of the Burlington-Keokuk Formation varies depending upon the extent of surface weathering. The unit occurs from approximately elevation 590 to 710 feet NGVD, having an irregularly weathered upper contact with Pennsylvanian deposits and residuum.

(4) Warsaw Formation. The Warsaw Formation is a shaley argillaceous, Middle Mississippian limestone, occurring in limited exposures overlying the Burlington Limestone in several creek valleys in the extreme western portions of the project area. It occurs between elevations 650 and 680 feet NGVD, and unconformable contacts with overlying Pennsylvanian age strata. Chert nodules and some geodes are common in the unit.

(5) Pennsylvanian Age Strata. Several formations of Pennsylvanian age occur, primarily in the western portions of the project area. These strata have been deposited unconformable upon the eroded surface of the Burlington-Keokuk and Warsaw Formations. Their thickness, lithology and areal extent vary greatly. The mapping of these units has not been detailed, as their impact upon the reservoir is negligible, because they occur above the maximum pool elevation. The most persistent and well defined of these units is the Cheltenham, which contains shales, clays, and a basal conglomerate. The clays of the Cheltenham locally contain economic grade fire clay, which has been mined in the past near the towns of Stoutsville and Goss. Also occurring in the western portions of the project area is the cyclothem of the Cabannis Subgroup, which includes the Tebo, Weir, and Scammon Formations. Some minor amounts of low-sulfur coal have been mined from the Cabannis Subgroup near Perry, but no significant reserves are presumed present within the project area.

(6) Pleistocene and Recent Deposits. Overlying the irregularly weathered bedrock surfaces are unconsolidated materials of Pleistocene and Recent age. These include pre-Illinoian glacial till and subsequent loessal deposits, residuum from the weathered sedimentary formations, and recent alluvium in the floodplains. The unconsolidated materials present in the uplands consist of

weathered residuum from the late Mississippian and Pennsylvanian formations, glacial till, and loess. The residuum is characteristically clayey with chert remnants throughout. The glacial till occurs as a more granular soil, and it, as well as the overlying loess deposits, is not as thick in the uplands as in the lowlands and valleys. The flood plain deposits consist of Pleistocene glacial outwash in the deeper pre-glacial river valleys, overlain by finer recent alluvium. The glacial outwash is primarily gravely sand, whereas the recent alluvium consists mostly of silts and clays.

c. Summary of Geology, The nature of significant economic mineral deposits within the project area makes any protective measures beyond slope or erosion protection unnecessary. Sufficient reserves of fire clay, coal, and other geologic resources are present outside the project area to preclude the exploitation of any deposits within Government property lines. Geologic items of a collectible nature such as the geodes present in the Keokuk Limestone and its weathered residuum, and the rather unique pyritized fossils of the Hannibal Shale may be deemed significant enough to consider them a resource that warrants management.

## 5.02 ARCHAEOLOGICAL/HISTORICAL

a. The St. Louis District Historic Properties Management Report No. 47, Historic Properties Data Synthesis, Mark Twain Lake, Missouri, September 1995 provides site information to project personnel on the subject of identified archaeological sites, material and remains. The Historic Properties Management Report documents archaeological investigations in the Mark Twain Lake region, prior to impoundment. The pre-impoundment archaeological research in the project region is divided into four phases:

1. 1959-64, the University of Missouri surveyed and excavated archaeological sites under a cooperative agreement with the National Park Service.
2. 1967-68, University of Missouri, under contract with the National Park Service, excavated nine archaeological sites.
3. 1974-May 1977, University of Nebraska, under contract with the U.S. Army Corps of Engineers, St. Louis District, conducted further survey and testing.
4. May 1977 - August 1980, the Cannon Reservoir Human Ecology Project (CRHEP) was executed.

The combined archaeological research efforts performed in the Mark Twain Lake Project area identified over 1500 prehistoric sites and 300 historic sites ranging in age from 12,500 to 100+ years old.

b. In addition to the subsurface remains, a total of 225 historic buildings were evaluated prior to impoundment. Of these, a total of 25, were recorded to standards established by the Historic American Building Survey (H.A.B.S.)

standards. Prior to impoundment, and following completion of the H.A.B.S. documentation, all historic structures were raised and removed from the project area.

c. It is the policy of the St. Louis District to manage historic properties at the same level as other programs (i.e. recreation, wildlife, flood control, etc.). The St. Louis District Historic Properties Management Plan, Mark Twain Lake, September 1994 serves as a reference to assist lake personnel in managing identified cultural resources and meeting federal regulations concerning cultural resource management.

### 5.03 ECOLOGICAL CONDITIONS

a. **Wildlife Resources.** The wildlife species known or expected to occur on the Mark Twain Lake area are those common to the region in general. The land and its plant association support an upland game population, predators and a variety of non-game mammals and birds. Although the project is located in the Mississippi Flyway, the major flights of waterfowl normally pass down the Mississippi to the east and the Grand River to the west. There are; however, sufficient numbers of waterfowl using the lake to have a huntable population. Some "threatened" or "rare and endangered" species do occur in the area; these are discussed in Section 6.13.

Wildlife population limiting factors at Mark Twain Lake appear to be minimal. The project lands surrounding the lake encompass some of the best upland habitat in northeastern Missouri. The ratio of open land to forest cover creates the desirable edge effect. Food and cover are both abundant and well-interspersed. Woodlots, lake shore, timber and brushy field borders furnish all the requirements necessary to support viable wildlife populations. The presence of the lake benefits some species. For example, flooded timber in the tributary streams furnishes nesting and brood rearing sites for wood ducks. Many more shorebirds and waterfowl utilize this area than ever before.

The Corps has designated and manages 14,536 acres of land exclusively for fish and wildlife purposes at Clarence Cannon Dam and Mark Twain Lake, Missouri. In 1978, the MDC notified the St. Louis District that they could not accept a license at the project for fish and wildlife management. Accordingly, the St. Louis District has accepted the responsibility to implement and manage the program with its personnel and resources. Land management procedures on public lands benefit many of the species present and attract other species to the area. Such procedures are beneficial to songbirds, game birds, and mammals. Trees and shrubs have been and will continue to be planted to provide nesting cover and food for all wildlife species. Wildlife food plots varying in shape, size and species composition are planted in areas to increase available foods for wildlife. Succession control in the form of mowing, disking, and prescribed fire eliminates woody plants while providing diversity among herbaceous plants, in contrast to adjacent untreated areas. Nest boxes

provide additional nesting spaces for wood ducks, purple martins, house wrens, tree swallows, bluebirds, and squirrels. Together, the private farms and the public wildlife areas provide a proper balance of food and cover for wildlife over much of the project. Nine wetland sub-impoundments have also been developed to provide for waterfowl management. These areas are managed by periodically manipulating water levels to provide resting and feeding areas for migratory waterfowl. Areas that are in the agricultural lease program provide additional food and cover for waterfowl and other wildlife species. Civic and private organizations in partnership with the Corps of Engineers assist in the development of structures beneficial to all wildlife on public lands.

b. Aquatic Resources. The impoundment of Mark Twain Lake has caused a decrease in fast-water adapted fish species, and an increase in slow-water adapted fish species. Species found in the lake pool include the following: black bass, white bass, black crappie, white crappie, bluegill, green sunfish, and several species of minnows including common carp, several species of suckers, gars, freshwater drum, and gizzard shad. The tailwater downstream of the re-regulation dam yields sizable concentrations of crappie, white bass, channel catfish, flathead catfish and walleye.

The Mark Twain Lake Project Office coordinates with the MDC on the management of the fisheries resource at the project area. Water regulation aspects at the project having a potential effect on fish include (1) water level fluctuations governed by annual precipitation patterns and power generation demands (2) a weir at the front of the dam that keeps the water released through the turbines close to the natural river temperatures, (3) tainter gates used during high water periods and a concrete apron with force diffusers, and (4) a re-regulation dam that impounds a 9.5 mile pool downstream from the main dam to provide storage for pump-back power generation and dampen fluctuations downstream. The re-regulation pool normally can fluctuate up to eight feet.

To support fisheries habitat, standing timber was left in coves, along some shorelines, and portions of the main lake basin. The lake's fish population is periodically sampled and evaluated by MDC, with age and growth rates of key species determined annually. Periodic checks of reproductive success are made with a comprehensive sample being taken in the fall. In the future, if large numbers of commercial fish species reach a marketable size, a limited commercial fishing program may be considered. However, such a program would utilize that portion of the fisheries not highly desirable or susceptible to sport fishing. Predator species not showing adequate survival or contribution to the creel will not be considered for future supplemental stockings. Sportfish species may be stocked periodically if natural reproduction is insufficient to maintain fishable populations and if such stockings are supported by scientific evaluation and research. As the lake ages, it is expected that the lake's predators will establish an equilibrium between

themselves and the prey species. The more prolific predators will expand to their reproductive potential and become the dominant species. Other predators that are limited by lower reproductive potential or food availability will have a lower standing crop. The white bass can be expected to expand slowly at first, but will probably become a close competitor with the black bass and crappie as a co-dominant species in later years. The catfish species that are stocked will be native species that can be expected to sustain their populations as the lake ages.

The Corps of Engineers developed and operates a brood pond in the Sandy Creek Area of Mark Twain Lake. It is a 3.5 acre nursery pond, supported by two minnow ponds. The purpose of the pond is to raise game fish, such as largemouth bass, to a size where they are less vulnerable to predation. The water level within the brood pond is controlled by a spin-gate structure, which when opened, allows water to pass through the impoundment structure and into a catch basin.

c. Vegetative Resources. Prior to construction of the lake, about half of the present fee-owned project land was forested. The majority of this land was located above the lake pool elevation. The white oak-black oak-northern red oak (Forest Cover Type No. 52) is the most common association on upland sites. The white oak association (Forest Cover Type No. 53) also occurs frequently. Shagbark hickory comprises a substantial stocking on most upland sites. Dominant trees include white oak, northern red oak, and black oak. Hickory spp. and Ash spp. usually occupy the co-dominant or intermediate class. Sugar maple, elm, black cherry, red bud, flowering dogwood, and serviceberry are the predominant understory species. Understory shrub species include fragrant sumac, corralberry, greenbriar, and various forms of shade tolerant grasses.

Successional or invasional species that occur in the openlands include eastern red cedar, elm, sassafras, shingle oak, autumn olive, and honey locust. Herbaceous or woody shrub invasional species include blackberry, multi-flora rose, and sumac.

Flood plain forests of the Salt River basin are predominately silver maple and American elm (Forest Cover Type No. 62); however, local variations do occur in the area with such species as eastern cottonwood, sycamore, river birch, pin oak, green ash, persimmon, hackberry and black willow being common.

Although about half of the fee lands are forested, there is a significant portion in grassland or openlands. Openlands are comprised of cool season/forb grasslands, warm season native prairies, agricultural lands, and early to mid-successional fields. Openlands are managed through various means to provide diverse wildlife habitat. Mechanical manipulations (mowing,

successional disking, and supplemental food resource development), agricultural lease, and prescribed burning are employed to manage and maintain open lands. Even with these practices, portions of open land have reverted to natural succession with the invasion of such species as hawthorn, blackberry, elm, oaks and sassafras.

d. Insect and Vector Problems. For the most part, insects and other vectors are kept in ecological balance. At certain times of the year, mosquito problems arise when the area receives a combination of wet, warm weather. In Missouri, diseases such as St. Louis and eastern equine encephalitis are a potential threat each year, but the much-publicized West Nile encephalitis has overshadowed them recently. West Nile virus was first discovered in the United States in New York City in 1999 and spread to other states in the Northeast and along the Atlantic seaboard during 2000. West Nile virus invaded the Midwest in 2001, and by the fall of that year had been identified in eight crows in eastern Missouri.

The life cycle of these mosquito-borne viruses is complex. Reservoirs include wild and domestic birds, small rodents and other mammals, and perhaps even reptiles and amphibians. Vectors for these viruses include mosquitoes that feed on both birds and mammals. Horses and humans are accidentally infected when the level of virus activity in normal hosts becomes so great that it begins to "spill over" into other species.

Ticks can potentially transmit Rocky Mountain spotted fever, tularemia and lyme disease. In the past, none of these diseases have been a major health problem in the area. Other pests found in the Salt River Basin are chiggers, horseflies, leeches, and yellow jackets. Occasionally, rats present a minor problem in recreation areas where litter or food is overly abundant. Periodic checks of levees and dams on the project are conducted to survey for damage caused by ground hogs and other burrowing rodents that can weaken these structures. Pigeons roosting on the dam can create a health hazard and maintenance problems on the metal portions. There are no known significant adverse effects of any pest control programs now being carried out. Pest control programs are closely coordinated with appropriate-agencies to insure that the environmental effects are adequately considered. Pest control programs are discussed in detail in the OPERATIONAL MANAGEMENT PLAN.

#### 5.04 ENVIRONMENTAL AND SCENIC QUALITIES

a. Geologic Qualities, The site of the Clarence Cannon Dam is on the Salt River in northeastern Missouri, 63 river miles west of the Mississippi River. Mark Twain Lake is principally located in Ralls and Monroe Counties, and at normal pool extends 34 miles upstream on the North Fork of the Salt River, which is the main stem. The highest altitudes in the project area are on the flat upland divides, which reach a maximum altitude of about 780 feet. The local relief is

about 100 feet along the major tributaries and increases to about 200 feet along the main stem. The sides of the major valleys are dissected by short tributaries whose gradients extend from the flat upland to the valley bottoms; and the divides between these tributaries form a continuous belt of hills along either side of the major valleys. The Salt River and its major tributaries flow through meandering valleys bordered by steep rocky walls. Nearly all the valley meanders occur where the valleys are incised into limestone strata of the Mississippian age, or, near the Clarence Cannon Dam, into limestone above and below shale. An unusual feature of the valley bottoms along the Salt River is their great variability in width that is now reflected in the variable width of Mark Twain Lake.

b. Vegetative Qualities. The vegetative types are discussed in paragraph 5-03c. These different vegetative types combine to form moderate scenic qualities.

c. Land-Uses. Land management on project lands is, for the most part, complementary to scenic qualities. The majority of the adjacent lands are forested, but there is also a significant portion in open land.

d. Water Quality. The current water quality monitoring program is conducted every six weeks between the months of March and October. There are a total of ten samples collected, four lake sites, four tributary sites, one just below the dam and one below the re-regulation dam. These samples are taken to provide information on the following water quality parameters: alkalinity, total organic carbon (TOC), metals, ammonia-nitrogen, nitrate-nitrogen, ortho-phosphate, total phosphate, total suspended solids (TSS), total volatile suspended solids (TVSS), fecal coliform, pH, dissolved oxygen, specific conductance, oxidation-reduction potential (ORP), chlorophyll, pheophytin-a, sulfur bacteria, atrazine and alachlor. Data evaluated for the period from 1984 through 2000 indicate an improving to stable trend of water quality within Mark Twain Lake. Of the seventeen parameters measured, six indicate improved water quality, four are stable and seven suggest a possible degrading trend. The parameters that indicated improvement or remained stable are alkalinity, ammonia, nitrate, total suspended solids, volatile suspended solids, alachlor, and orthophosphate, phosphate, chlorophyll and atrazine. The parameters that suggest a degradation of water quality are: total organic carbon (TOC), iron, manganese, silica, pheophytin, dissolved oxygen and pH. The degrading water quality parameters of iron, manganese, TOC and silica are minor and may have been impacted by the 1993 and 1995 flood events. Pheophytin is increasing with the age of the lake, but is not at levels that would be considered excessive for good water quality. Data of the above degrading parameters over the past 3 years indicate a return to a more stable condition. Dissolved oxygen and pH both have decreasing trends in the lake system. The trends are minor, but should not be disregarded. Wastewater from industry or the general population could be impacting the oxygen demand and pH of the lake. The current trends do not

pose an immediate threat to water quality, but should be monitored to determine if conditions continue to degrade.

In previous years this lake was considered impaired based on the criteria that it exceeded Missouri Water Quality Standards for atrazine. In the past few years atrazine levels have decreased and the lake is scheduled for removal from the state's 2002 303(d) list.

Water quality reports are written and submitted to each Corps lake on a five-year cycle. An annual division water quality management report is also submitted.

The Missouri Department of Natural Resources has established water quality standards for designated uses to adhere to the Missouri Clean Water Law and the federal Clean Water Act. The water quality sampling conducted reflects the minimal parameters needed to indicate if the water quality can sustain adequate plant and animal life and to ensure safety for human recreation.

e. Visual Qualities. The combination of features listed in the above paragraphs form the overall visual qualities of the lake area. For Mark Twain Lake, the overall esthetic qualities are moderate. The primary reasons for this are the moderate relief topography, exposed rock, the interspersed forest and open land constituting the majority of adjacent land, and moderately turbid waters.

## 5.05 RECREATION

a. Recreation Development Description. Several areas have been developed at Mark Twain Lake for the visiting public to enjoy a variety of outdoor recreational experiences. The most common activities engaged in are fishing, boating, water-skiing, sailing, camping, picnicking, swimming and hunting. Developed facilities available at the lake include a visitor center, four campgrounds, three group camping areas, five picnic areas, twenty-one boat launching areas, five nature trails, two marinas, and three beaches. Hunting and fishing opportunities are available on all Corps of Engineers lands and waters except where restricted and posted due to recreational development or safety. (Section VIII presents a complete description of all recreational facilities.)

b. Effects of Recreation on the Environment. The development of recreational facilities and associated accesses has provided visitors with quality outdoor recreational opportunities with minimal effect on the environment. Campgrounds, picnic areas, boat ramps, etc. have been designed and developed in order to retain the outstanding esthetic quality on the lake and surrounding area. Waste collection and treatment is stringently regulated in

compliance with state and local regulations. Recreation management including regulating visitor use has kept site deterioration to a minimum. Vegetative and landscape management practices have controlled erosion and prevented potential environmental degradation. Developed roads and hunter fisherman parking areas have controlled off-road vehicle use while providing visitors with access to trails and underdeveloped wooded areas with minimal environmental impact.

## **SECTION VI - FACTORS INFLUENCING AND CONSTRAINING RESOURCE DEVELOPMENT AND MANAGEMENT**

### **6.01 GENERAL LAND AND WATER CONSTRAINTS**

a. The topography at Mark Twain Lake reaches a maximum elevation of about 780 feet NGVD in the southwestern portion of the project to a minimum of approximately 520 feet NGVD along the main stream of the Salt River. The North Fork, Middle Fork, Elk Fork and South Fork are the main tributaries of the Salt River within the project boundaries and have a maximum elevation of 675 feet NGVD in the western part of the project. The sides of the major valleys are dissected by short tributaries whose gradients extend from the flat uplands to the valley bottoms. The divides between these tributaries form a continuous belt of hills along either side of the major valleys. The land adjoining the project is relatively flat farmland.

Soil surveys have been prepared by the United States Department of Agriculture – Natural Resources Conservation Service (NRCS) for the counties encompassing Mark Twain Lake (Ralls and Monroe, Mo. Counties). Engineering as well as other land use interpretations for each soil unit encountered in the respective counties are included in these soil surveys.

The predominant soil units within the project area are the Armstrong-Leonard Association and the Goss-Gorin-Lindley Association. The Armstrong-Leonard Association is composed of the Armstrong and Leonard soils. The Armstrong soils are moderately to strongly sloping. They are well-drained dark gray to dark brown mottled lean and fat clays. The Leonard soils are moderately sloping, poorly drained gray lean clays. Minor soils in the Association are the well-drained, moderately steep Lindley soils and the well-drained, steep, Cherty Goss soils. These soils are on narrow ridge tops and steep side slopes. The Goss-Gorin-Lindley Association is composed of the Goss, Gorin and Lindley soils. The Goss soils are steep, well-drained, cherty clays and silts. The upper portion is typically very dark gray and brown. The subsoils are usually reddish to yellowish brown. The Gorin soils are moderately sloping and are on ridge tops above the Lindley soils. The Gorin soils are poorly drained gray to brown silty clays. The Lindley soils are steep well-drained soils on narrow ridge tops. The surface layer is dark gray to brown clay and the subsoils are yellowish brown clays. The minor soils in this association are the well-drained, nearly level Cedargap soils; the moderately well-drained, moderately sloping to strongly sloping Armstrong soils; the poorly drained, sloping Calwoods soils; and the moderately well drained, strongly sloping and moderately steep Gosport soils. The Cedargap soils are on narrow ridge tops and on side slopes

in positions higher than those of the Goss and Lindley soils. Gosport soils are in positions similar to those of the Goss soils.

The soils of the area present several problems. They are erosive particularly when the shoreline of the lake is subjected to periods of high water combined with windy conditions. Bank erosion and caving can occur. Many of the soil deposits are in an area of glacial origin, and include rocks and boulders of large to moderate size at or immediately beneath the ground surface. These conditions can complicate foundation and utility trench design and placement, thus requiring additional expense.

b. Water Constraints The lake level may rise or fall depending upon the natural factors of flood and drought. During flood control operations, the level of the lake is allowed to rise so that the adverse effect of flooding to downstream areas can be minimized.

**6.02 DEMOGRAPHIC DATA**

The following is a brief economic and demographic analysis of Monroe and Ralls Counties, Missouri. The combined area is located northwest of the St. Louis, Missouri - Illinois Standard Metropolitan Statistical Area (SMSA). This investigation will focus on a statistical analysis of past, present and future trends of counties mentioned above. TABLE 6-1 and FIGURE 6-1 reveal a 4.2 percent decrease in population for Monroe County and an 8.0 percent increase for Ralls County from 1980 to 2000. Both counties exhibited a downward trend at the time of the 1990 Census. The study area as a whole experienced a decrease in population of about 2.0 percent for this period.

**TABLE 6-1 COUNTY POPULATIONS BY DECADE**

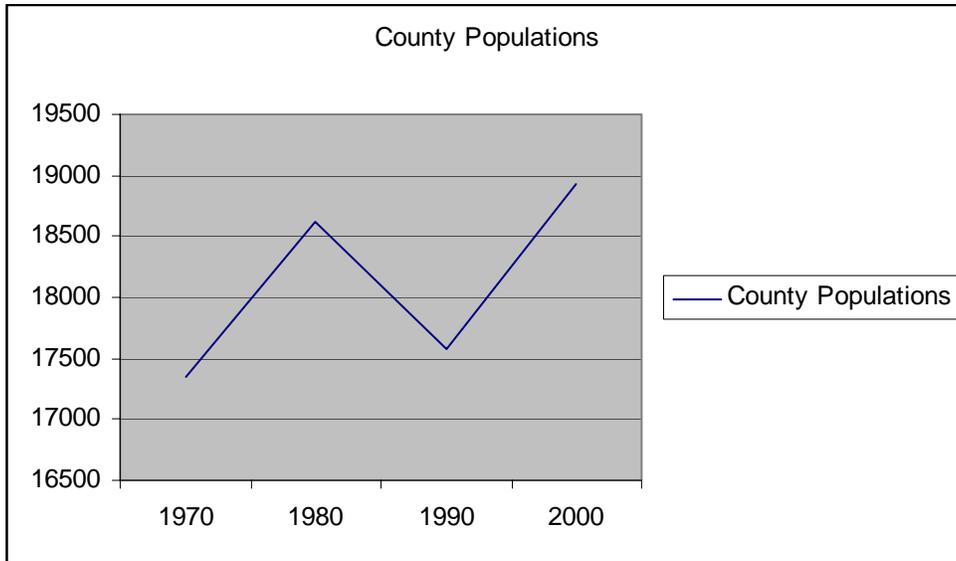
	2000 <sup>1</sup>	1990 <sup>1</sup>	1980 <sup>2</sup>	1970 <sup>2</sup>
Monroe County	9,311	9,104	9,716	9,499
Ralls County	9,626	8,476	8,911	7,846
TOTAL	18,937	17,580	18,627	17,345

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<sup>1</sup> Missouri Census Data Center; Missouri (Counties, Places Metropolitan Areas); May 2001.

<sup>2</sup> U.S. Department of Commerce, Bureau of the Census; 1980 Census of Population; General and Social Economic Characteristics – Missouri; April 1980.

**FIGURE 6-1 - COUNTY POPULATIONS - COMBINED POPULATION TRENDS OF RALLS AND MONROE COUNTIES**

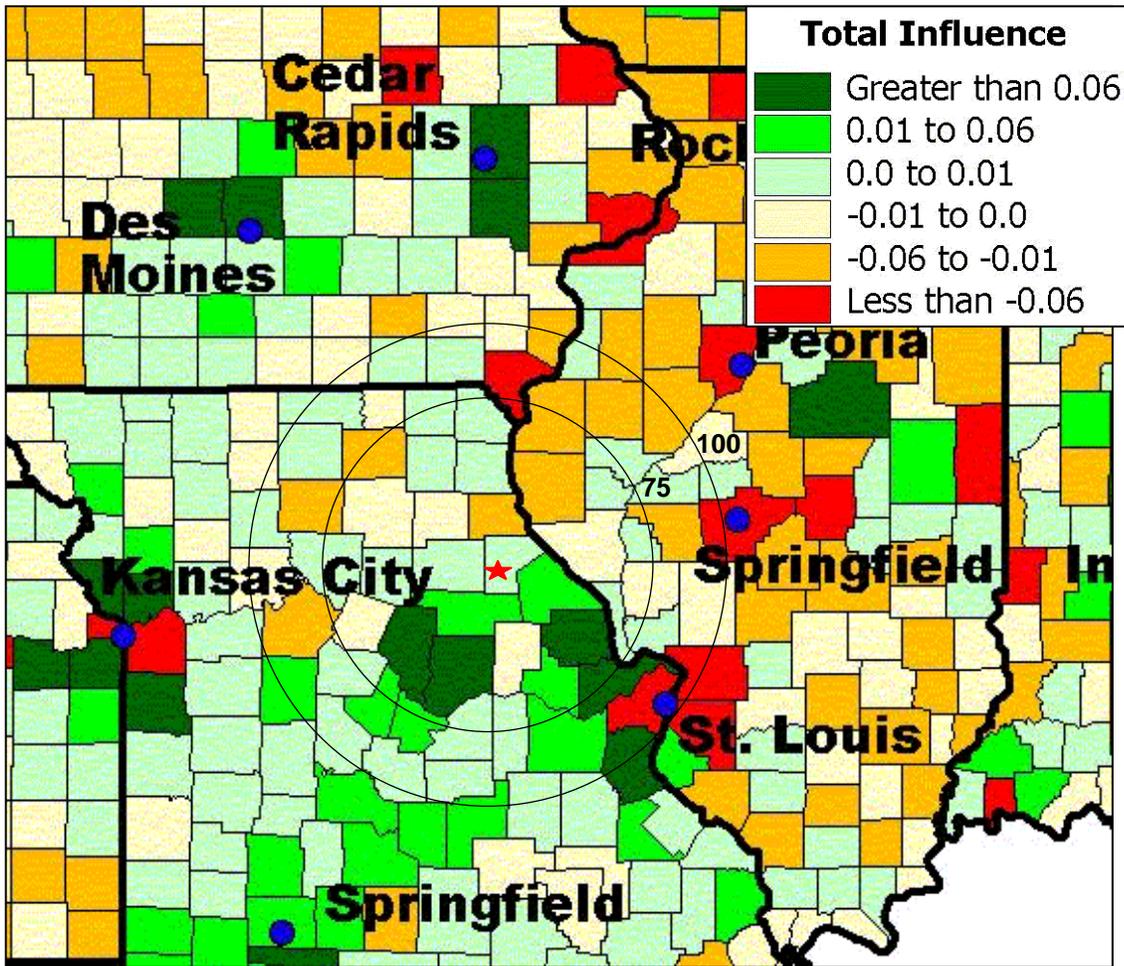


**6.03 AREA OF INFLUENCE**

a. General. A 100-mile radius of influence, centered on the dam site, has been adopted for purposes of this Master Plan. The area of influence shown in Figure 6-2 encompasses 37 northeast Missouri counties, 19 western Illinois counties and 8 southeastern Iowa counties. The St. Louis SMSA is located in this zone of influence and represents the majority of population and industrial concentration. The remainder of the area is substantially agriculture. Excluding St. Louis City and County, 79.7 percent of all land in 1980 was designated as farmland. This land use percentage attributed to farmland decreased to 77.2 percent in 1990.

The economic influence of counties in the Midwest Region of the U.S. between 1995 and 2001 was presented in reports developed by the Missouri Economic Research and Information Center, Missouri Department of Economic Development. A county's economic influence is a composite of changes in employment, population and income, and the percentage of a region's economy held by a county. Two very strong areas of economic influence are located in the Columbia, Missouri area and the St. Charles, Missouri area. See Figure 6-2 below for a map showing economic influence by county. Future efforts at marketing the lake may be directed to these areas.

FIGURE 6-2 Zones of Influence and Economic Influence of Counties



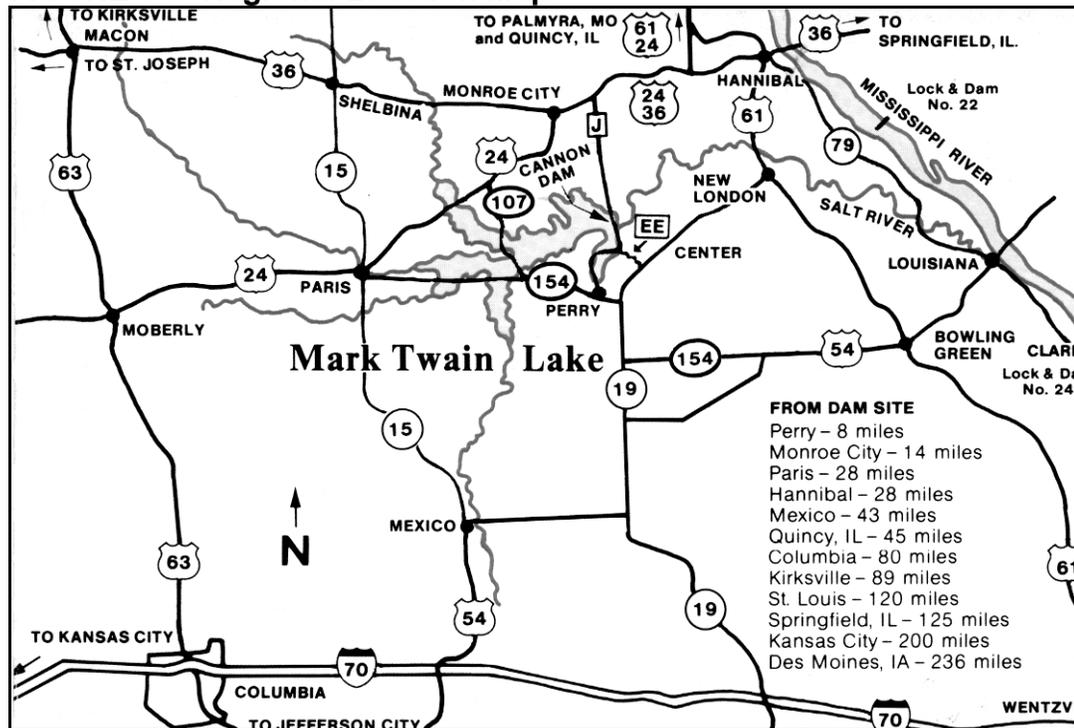
b. Industries. Although the manufacturing sector of the economy employs the greatest percentage of people in the area, manufacturing employment decreased 12.0 percent between 1980 and 1990. The service industry, on the other hand significantly increased employment by 14.6 percent for the same period. This trend mirrors the national trend towards increased employment opportunities in the service sector. The predominant manufacturing industries in the area of influence involve the manufacture of air and spacecraft, metal and metal products, chemicals, and refining and distributing petroleum products.

c. Transportation and Road Network<sup>3</sup>. FIGURE 6-3 portrays the location of Mark Twain Lake with respect to the major highways within the area. U.S. Highway

<sup>3</sup> Market Potential and Feasibility Analysis for Commercial Concession Development at Mark Twain Lake, Parsons Harland Bartholomew & Associates with Fact Finders, Inc., January 2001

24 and State Highway 154 parallel the northern and southern sides of Mark Twain Lake respectively, with State Highway 107 bisecting the Lake and connecting the two highways. Route J parallels the eastern side of the Lake, and crosses over the Clarence Cannon Dam. The Corps of Engineers Operations Center and Visitor Center are located on Route J. U.S. Highway 61, a four-lane divided highway that provides the primary access from the St. Louis Metropolitan Area, is located approximately 15 miles east of the Lake. U.S. Highway 24/36 and State Highways 19 and 154 provide the primary access to Mark Twain Lake from U.S. Highway 61.

**FIGURE 6-3 Regional Location Map**



**TABLE 6-2  
 Daily Traffic Count (ADT) Trends, 1990-1999<sup>1</sup>**

Highway Segment/Location	1999	1995	1990
U.S. Highway 61 @ State Highway 19	11,075	7,985	6,888
State Highway 19 @ Highway H-P	3,826	3,008	2,450
State Highway 154 @ Routes J-B	2,305	2,604	1,814
State Highway 154 @ State Highway 107	982	1,000	850
U.S. Highway 24 @ Route J	5,971	5,418	4,463
Route J @ U.S. Highway 24-36	1,182	1,370	1,076
Route J @ Route A	1,535	1,782	1,398
State Highway 107 @ U.S. Highway 24	452	258	294
State Highway 107 @ Route U	836	418	412

<sup>1</sup> Includes bi-directional traffic.

Source: Missouri Department of Transportation, Office of Transportation Management Systems.

TABLE 6-2 provides a summary of the daily traffic count trends on the highways in the immediate vicinity of Mark Twain Lake during the 1990-1999 period. Major traffic movement within the area is on U.S. Highway 61 on which traffic increased by 60 percent during the 1990-1999 period. Traffic on the major feeder highways from U.S. 61 to Mark Twain Lake has also increased during this period, with increases of 56 percent on State Highway 19 and 33 percent on U.S. Highway 24. However, as indicated in TABLE 6-2, daily traffic volume on the roads immediately adjacent to Mark Twain Lake has not increased substantially during this period. For example, daily traffic volume on Route J – a major center of activity on Mark Twain Lake – increased by only 10 percent during this same period. Overall daily traffic volume on State Highway 107 at Route U – the central point of Mark Twain Lake State Park – is approximately equal to one-half the daily volume on Route J, with about twice as much traffic coming from the south as from the north.

There are no short-range major highway improvement projects funded or planned for the immediate Mark Twain Lake area. State Highways 19 and 54 were on the Missouri Department of Transportation's 15-Year Plan for a 4-lane improvement, but the lack of funding has resulted in this plan being modified or postponed.

### 6.04 ECONOMIC CHARACTERISTICS

Manufacturing, services, retail trade and agriculture comprise the major employment sectors in Northeast Missouri. Total full-and part-time employment in the more immediate area of Monroe and Ralls counties totaled 9,481 in 1998, of which 22 percent were engaged in manufacturing; 19 percent in agriculture or farming; and 17 percent each in retail trade and services. Employment within Monroe and Ralls counties has increased 17 percent since 1990, approximately equivalent to the relative employment increase for Northeast Missouri, and exceeding the 14 percent statewide employment increase.

Employment directly associated with Mark Twain Lake and Mark Twain State Park includes employees of the U.S. Army Corps of Engineers, State Department of Natural Resources, Missouri Water Patrol, and the commercial concessionaires. The Corps of Engineers has 26 full-time employees with additional part-time summer employees, while the State Department of Natural Resources has seven full-time employees with additional part-time summer employees. The Missouri Water Patrol usually employs three-four seasonal employees for lake patrol. In addition, the Blackjack and Indian Creek marinas together have approximately 55 employees during the boating season (April–October), with a skeleton staff the remainder of the year.

## 6.05 ACCESSIBILITY

a. Major Highways. Major highways providing access to Mark Twain Lake are U.S. Highway 24 to the north and west, State Highway 154 to the south and State Highway 19 to the east. State Highway 107 runs north from Highway 154 bisecting the lake and ending at Highway 24. These highways provide the public with safe and adequate access to all areas of the project.

b. County Roads. Local county authorities are responsible for the maintenance of several off-project roads that provide the public with access from major highways to recreation areas. The condition of these roads varies, however, most can be considered as adequately maintained. The following roads with access descriptions are the primary routes of travel used by the visiting public.

(1) State Route J from Highway 154. This road provides access to the Ray Behrens, South Spillway, John C. "Jack" Briscoe, North Spillway, Frank Russell, and John Spalding Recreation Areas, as well as the Mark Twain Lake Project Office. Ralls County.

(2) State Route EE from Highway 19. This road leads from Highway 19 west to Route J. Ralls County.

(3) State Route BB from Route J. This road leads to Route BB boat ramp; Hunter Fisherman Access 60. Ralls County.

(4) John F. Spalding Access Road (Old State Route J) from Route J. Leads to John F. Spalding Recreation Area. Ralls County.

(5) State Route N from Highway 24. Leads to Route N Boat Ramp, Hunter Fisherman Access 11. Monroe County.

(6) State Route HH from Highway 24. Leads to Indian Creek Access Road and Shell Branch Recreation Area, Hunter Fisherman Access 15. Monroe County.

(7) Indian Creek Access Road (County) from State Route HH. Leads to Indian Creek Recreation Area. Monroe County.

(8) State Route U from Highway 107. Leads to Mark Twain State Park and Historic Area. Monroe County.

(9) Robert C. Allen Access Road (County) from Highway 154. Leads to Robert E. Allen Recreation Area. Monroe County.

## 6.06 RELATED RECREATIONAL AND HISTORICAL AREAS

The Mark Twain Lake Project is the primary source of outdoor recreational activities for the area. Hunnewell Lake administered by the Missouri Department of Conservation and the Route J Reservoir run by Monroe City are the two closest lakes to Mark Twain Lake and both lakes are very small. Although these have camping, picnicking and boating opportunities, they do not compete nor compare to the opportunities offered at Mark Twain Lake. The Mississippi River is approximately 30 miles from Clarence Cannon Dam and provides the public with numerous outdoor recreational opportunities on a large river environment. Hannibal, Missouri, located 28 miles northeast of Clarence Cannon Dam, is the site of Mark Twain's Boyhood Home. A shrine

commemorating the birthplace of Mark Twain is located on Mark Twain State Park lands near Florida, Missouri. These two historical areas provide visitors to the lake with supplementary points of interest.

### 6.07 RESERVOIR PLAN OF REGULATION

Operational concepts and plan of operation for Mark Twain Lake are explained in Paragraph 2.03.

### 6.08 RELOCATIONS OF ROADS, CEMETERIES, RAILROADS, AND UTILITIES

#### a. Highways.

By authority of a one time approval by Office of Chief of Engineers, the top of pier elevations for State Highways were set relative to an assumed flood of record estimated at 640.0 feet NGVD. Elevations for County roads were determined by the classification of the particular road and minimum elevations vary between 626.0 feet NGVD and 636.0 feet NGVD. The general policy used in the plan of relocation was to maintain the continuity of the existing road network on each side on the reservoir and to provide access to remaining properties and residences adjacent to the reservoir substantially equivalent to that which they previously had.

#### b. Railroads.

Operations on the Mark Twain Lake project affected the Norfolk and Western Railroad system at two locations. It was required that the track be relocated in the general vicinity of Stoutsville, Mo. One section of track was relocated to the north of the old alignment beginning at a point approximately 1,900 feet west of the North Fork Salt River crossing and extending eastward through Stoutsville, MO and northward to a point approximately 100 feet north of U.S. Route 24. Another section of track was relocated to the south of the old alignment extending 3,400 feet west and 2,400 feet east of the Otter Creek crossing. These sections of track were relocated with base of rail at minimum elevation 644.5 feet NGVD. The relocation involved the reconstruction of the bridges over the North Fork of the Salt River and Otter Creek to a low steel elevation of 638.5 + and 642.0 feet NGVD respectively. In addition to the above relocations, the end cones of the embankments at each abutment of the Burlington Northern Railroad Bridge at the North Fork River crossing were protected from pool effects by the addition of riprap on the end cone slopes.

#### c. Utility Lines.

(1) All major power and telephone facilities within the limits of the conservation pool have either been relocated or removed except for two large power lines. A 69 KV transmission line, owned by Northeast Missouri Electric Cooperative, crosses the project limits immediately downstream of the main dam. A second 69 KV transmission line, owned by Central Electric Power Cooperative, crosses the project just below the South Fork Recreation Area.

(2) In general, clearances are not less than those outlined in the National Electrical Safety Code for all affected by the reservoir.

(3) Two 12-inch diameter Amoco pipelines and a 6-inch diameter Monroe City natural gas pipeline cross the Salt River downstream of the Main Dam and spillway. All three pipelines were relocated to allow the channel to be widened for hydropower operation. Relocation consisted of new pipe materials and concrete weights below elevation 530.0 feet NGVD that was equivalent to existing facilities. The original pipes and weights were removed from the site.

d. Cemeteries.

Thirty-four historic, EuroAmerican cemeteries were affected by the development of the Clarence Cannon Dam and Mark Twain Lake project. Of this total, thirty-three were located within project limits while one was located immediately outside project limits. Twenty-three cemeteries required relocation, seven cemeteries were provided with protective fencing, and four cemeteries were left in their existing condition. Cemeteries that required relocation involved approximately 500 burials. All cemeteries where the ground surface was below elevation 642 feet NGVD were relocated to put them above the lake level that would result from a standard project flood. Cemeteries located within the vicinity of limited recreation development above the 642 feet NGVD elevation were left in place and fenced. Cemeteries located at or above elevation 642.0 feet NGVD, but on Government lands planned for extensive recreational development were also relocated.

## 6.09 EARTH BORROW AND DISPOSAL AREAS

The project has four major disposal areas within its boundaries. One of the areas is inundated by the lake. Two of the sites are immediately downstream of the dam along the exit channel. These sites are now recreation areas with roads, parking and boat launching facilities. Two other sites have been re-vegetated. One of these sites is located near a water tower just off County Road J where it crosses the lake and the other location is downstream of the exit channel. These sites can be developed, however, subsurface conditions can have extreme variations (boulders, rocks, debris, etc.) and cause additional design and construction costs. Any development such as parking lots, roads and buildings should consider the past use of the land, loads, potential settlements, and excavation techniques required (boulders, rocks, etc.). Disposal areas should be investigated thoroughly before development.

## 6.10 WATER QUALITY

The affect of coal strip mines, soils of high clay content, and non-point source runoff causes the watershed to have elevated levels of sulfur, iron, nutrients, and colloidal suspended solids. The reservoir has a shallow photic zone, very shallow epilimnetic zone, high algal productivity, and extremely stable stratification. This causes the lake to be eutrophic with an extreme oxygen deficiency within the hypolimnetic waters. The water temperature

control weir appears to function as designed during periods of power generation. However, evacuation of the forebay upon start-up of turbines causes water of poor quality to be released into the re-regulation pool.

Releases from the re-regulation dam had caused downstream problems in the past. Stop logs placed in one gate to act as a skimming weir were used as a temporary cure for downstream problems. A fluctuating intake that changes in conjunction with pool elevation to allow upper level water of good quality to be released downstream was installed in November 1988. This structural modification has provided adequate downstream water quality.

The lake water met state standards applying to primary and secondary contact recreation for the purposes of swimming, boating, fishing and water skiing. The lake appears to be a suitable source for drinking water, both presently and in the future, with the possible exception of taste and odor problems associated with algae. The project area has several pollution potentials, but now no major form of degradation to the lake or streams is apparent. In accordance with an agreement with the Missouri Dept. of Conservation, the pool elevation will be maintained at a constant to slowly rising level during the time of shad and bass spawns if possible, to avoid desiccating the eggs. Water quality monitoring will continue at various locations throughout the watershed to protect human health, public safety, and economic welfare of those at Corps projects, to insure downstream water quality, and to protect the district from litigation and adverse public reaction. Annual Water Quality Reports are written in accordance with ER 1110-2-8154 (Water Quality and Environmental Management for Corps Civil Works Projects) 31 May 1995 and submitted to Division.

### 6.11 FOREST, MINERAL, AND WATER RESOURCES

The pre-project exploitation of mineral and timber resources near the project area was not considered detrimental to public use and enjoyment of the resource base, nor does it constrain or influence resource development and management.

a. Timber Resources. Major forest types of commercial value found within the project area are oak-hickory, and bottomland hardwoods. At present the timber resources can be classified as poletimber or immature sawtimber. The existing timber quality is a direct result of past land management practices prior to purchase. There is, however, the potential to support local mills with limited intermediate cutting practices, establishing a solid timber base for future planning.

(1) The Oak-Hickory Forest Type. The white oak-black oak-northern red oak (Forest Cover Type No. 52) is the most common association on upland sites. The white oak association (Forest Cover Type No. 53) also occurs frequently. Shagbark hickory comprises a substantial stocking on most upland sites.

Dominant trees include white oak, northern red oak, and black oak. Hickory spp. and Ash spp. usually occupy the co-dominant or intermediate class. Sugar maple, elm, black cherry, red bud, flowering dogwood, and serviceberry are the predominant understory species. Understory shrub species include fragrant sumac, corralberry, greenbriar, and various forms of shade tolerant grasses

(2) The Bottomland Hardwoods Forest Type. Flood plain forests of the Salt River Basin are predominately silver maple and American elm (Forest Cover Type No. 62); however, local variations do occur in the area with such species as eastern cottonwood, sycamore, river birch, pin oak, green ash, persimmon, hackberry and black willow being common.

b. Mineral Resources. No economic deposits of metallic minerals occur within the project area; however, there are other deposits of economic or potentially economic grade resources within the reservoir area. These include fire-clay, limestone, sand and gravel, and coal.

(1) Fire-Clay. The Cheltenham Clay is the chief source of high-grade ceramic clay in the region, and is known to occur within the project area, and adjacent uplands. At present, clay is only being produced locally in the Goss area, approximately 14 miles west of the dam site. These deposits generally occur at elevations above maximum flood pool; however, it is possible that some of the clay pits may be deep enough to be impacted by prolonged periods of high pool. Sump pits in some of the excavations are below maximum flood pool, but it is believed that seepage into these pits from the reservoir will be minimal due to the short periods of high water and natural topographic boundaries between the pits and the reservoir.

(2) Limestone and Gravel. Limestone is suitable for use as flagstone. Crushed stone is common in the reservoir area and outcrops are numerous. To be commercially useful limestone should be chert free with relatively shallow overburden, accessible to transportation, and relatively free of impurities. The potentially economic limestone units within the project area are the Chouteau and the lowest portion of the Burlington Formations. There are a few limestone quarries in the area, but no known active quarry will be impacted by even extended periods of maximum pool. The quarry previously operated by the State of Missouri for resurfacing Highway J is now inundated by the reservoir.

(3) Sand and Gravel. There were, at the time the dam was under construction, several producers of sand and gravel operating in the project area. Production of sand and gravel is generally accomplished by locating a suitable bar or deposit in the riverbed, and removing the material by dragline or similar procedure. After depletion of the deposit, or location of more economically exploitable deposits elsewhere, the operation is moved. The worked sites are sometimes replenished during seasonal periods of high water, and may be reworked following sufficient re-deposition. The completion of the dam and reservoir has virtually eliminated this cycle of replenishment, to the extent that production will be limited to existing deposits downstream of the dam

without significant renewal. Because of the method of operation, all of the areas upstream of the dam have been impacted by the reservoir. Those areas inundated by the pool are no longer accessible to exploitation.

(4) Coal. There are no economic coal deposits known to exist within the reservoir area; however, there have been small coal strip mining operations on lands near the project area southeast of the reservoir. The mining has been of low sulfur coals in the discontinuous Pennsylvanian Cabannis Subgroup. Minor discontinuous coal seams exist within the reservoir area in the Tebo, Scammon, and Weir cyclothems of the Cabannis Subgroup. These deposits outcrop along some of the tributaries of the Salt River in the southern and western portions of the reservoir area west of Highway 107, along Highway 154. These deposits are found at elevations from 640 to 690 feet NGVD, generally above the maximum flood pool.

c. Groundwater. Groundwater near the reservoir is obtained from several sources. Shallow sources of groundwater include the glacial till and recent alluvium in the valleys of the Salt River and some of the tributaries. Deep sources are the Burlington and other early Mississippian limestones, and the St. Peter Sandstone (Ordovician.) The majority of producing wells on farms in the vicinity are in the Burlington Limestone. Water quality varies with the degree of mineralization. The wells producing from the alluvium generally yield water containing lower mineral content, and consequently better quality water. Many of the wells on farms in the vicinity produce water that is mineralized to the extent that farmers haul water or have cisterns for domestic use. There appear to be three groundwater levels present in the reservoir area, and not all three are necessarily present everywhere.

Well capacity, although not completely a function of well depth, is generally greater in the deeper wells. Shallow-dug wells produce varying amounts of water generally in the range of 1 to 5 gpm. Wells drilled to depths from 70 to 300 feet produce from 5 to 13 gpm, and wells deeper than 300 feet may produce anywhere from 5 to 50 gpm. No negative impact on water quality or well production is anticipated as a result of lake management policy. The impact on groundwater resources from wells and waste treatment facilities associated with recreation areas should be addressed on a site-specific basis.

### 6.12 RECREATION ATTENDANCE AND FACILITY REQUIREMENTS

a. Existing User Demand. Existing user demand is reflected using 2001 visitation as a basis for computations. Facility requirements are based on current visitation, design criteria, and guidelines detailed in the Institute for Water Resources' Research Report 74-RI (Estimating Recreational Facility Requirements, Volume IV). These requirements are oriented toward key facilities that include campsites, picnic units, boat launching lanes and beach area. This planning methodology estimates the number of facilities necessary to satisfy recreation use on an average weekend day during the peak month of visitation.

(1) Facility Design Day Load. This determination represents the anticipated number of users visiting the project on an average weekend day during the peak month of use. Based on 2001 visitation, the present facility day load is estimated at 26,904. (See TABLE 6-3, Actual and Projected Annual Visitation).

(2) Summary of Existing User Demand. Utilizing the facility design day load, participation rates for each activity requiring facilities, and the appropriate activity turnover rates, the principal recreation facility requirements were estimated. The existing facility user demand estimate is presented in TABLE 6-4.

(3) Summary of Existing Facility Supply. The existing supply of key park and recreation facilities is presented in TABLE 3-1 in Section III. The principal agencies developing facilities at Mark Twain Lake are the Corps of Engineers and the Missouri Department of Natural Resources. The state contributes to the supply of campsites, picnic sites, boat launching ramps, and beaches. Appendix A discusses recreation facility development (existing, proposed, future) by the Missouri Department of Natural Resources.

TABLE 6-3 ACTUAL AND PROJECTED ANNUAL VISITATION IN RECREATION USE DAYS <sup>4</sup> MARK TWAIN LAKE, MISSOURI	
Year	Actual
1976	220,536
1977	146,023
1978	295,021
1979	229,300
1980	215,171
1981	139,741
1982	258,057
1983	424,339
1984	665,577
1985	850,700
1986	1,684,372
1987	1,863,104
1988	2,030,000
1989	1,865,980
1990	1,834,157
1991	1,849,844
1992	1,648,429
1993	1,423,489
1994	1,696,376
1995	1,685,983
1996	1,636,607
1997	1,664,087
1998	1,218,199
1999	1,794,386
2000	1,836,028
2001	1,806,966
2002	2,306,286
<b>PROJECTED<sup>5</sup></b>	
2010	2,282,683
2015	2,485,063
2020	2,687,443

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<sup>4</sup> See Table 2-1 for visits and visitor hour data.

<sup>5</sup> Computed using FORECAST equation in EXCEL for the years 1990 – 2002.

**TABLE 6-4 PRINCIPAL RECREATION FACILITIES:  
EXISTING SUPPLY AND DEMAND SUMMARY**

Facility	Corps	State**	Total	Existing Demand	Existing Excess(+) /Shortage(-)
<b>Camp Units* (trailer or tent)</b>	465	103	568	740	-172
<b>Picnic Units</b>	90	30	120	112	+8
<b>Boat Ramp Lanes</b>	45	9	54	52	+2
<b>Swimming Beach (Linear feet of shoreline)</b>	1016	300	1316	1345	-29

\*Number includes sites able to accommodate trailer and/or tent camping. The hike-in tent camping area at Indian Creek, the tent only area at the Indian Creek Group Use Area, the Hunter/Fisherman Lot sites and the John C. "Jack" Briscoe Group Use Area are not included in this total.

\*\*Number of facilities located on State Park fee title lands.

(4) Evaluation of Existing Supply and Demand

(a) Camp Units - The most critical need for new facilities is for additional camping facilities. The existing supply falls short of demand by 172 campsites as shown in TABLE 6-4. Campsite utilization percentages for Saturday nights averaged by month for the years 2000 through 2002, shown in TABLE 6-5, indicates that camping is on the rise at all three campgrounds.

Plans for additional sites in the Indian Creek Campground were proposed and approved in Supplement No. 7, Additional Recreational Facilities, Design Memorandum, No. 9, the Master Plan, 1982. However, based on current visitor use patterns and trends, the Ray Behrens Campground would be the preferred location to meet this demand.

While these additional campsites would help meet the current demand, growth in visitation is expected, based upon recent visitor use trends. According to these trends and existing demand for camping units (See Table 6-4), growth in demand for campsites and support facilities is expected.

A campsite reservation system was initiated in 1990 to alleviate some of the problems caused by the lack of campsite availability. In 1990, the reservation system was limited to 75 sites in the Indian Creek Campground. Because of the popularity of the reservation system, the program has been expanded to include various loops in all three campgrounds.

TABLE 6-5

<b>CAMPSITE UTILIZATION PERCENTAGES</b>				
<b>RAY BEHRENS</b>		2000	2001	2002
	MAY	74%	76%	63%
	JUNE	74%	86%	93%
	JULY	83%	72%	92%
	AUGUST	71%	80%	84%
	<b>AVERAGE</b>	<b>76%</b>	<b>79%</b>	<b>83%</b>
<b>INDIAN CREEK</b>		2000	2001	2002
	MAY	58%	51%	46%
	JUNE	55%	60%	62%
	JULY	66%	65%	68%
	AUGUST	53%	60%	64%
	<b>AVERAGE</b>	<b>58%</b>	<b>59%</b>	<b>60%</b>
<b>FRANK RUSSELL</b>		2000	2001	2002
	MAY	49%	44%	40%
	JUNE	35%	53%	72%
	JULY	45%	50%	60%
	AUGUST	38%	52%	54%
	<b>AVERAGE</b>	<b>42%</b>	<b>50%</b>	<b>57%</b>

(b) Picnic Units – Picnic units have been reduced from a total of 310 in the previous Master Plan update to 120 in this plan. The public is not using this type of facility in large numbers except at beach areas where picnicking occurs frequently. The other recreation areas only require a smaller number of tables to meet demand. TABLE 6-4 shows a very small oversupply in picnic units provided as compared to estimated demand.

(c) Boat Launch Lanes - TABLE 6-4 shows an oversupply in the number of boat launch lanes available compared to estimated demand. However, because some of the lanes are located in very remote areas, use is not evenly distributed at all of the ramps and some experience periods of overcrowding.

(d) Swimming Beach Area - TABLE 6-4 shows a small deficit in linear feet of beach available to visitors. However, a large portion of the beach frontage is concentrated in only one public beach area that already experiences overcrowding occasionally. Of the three beaches at the lake, one is only open to campers at the Indian Creek campground. Availability of swimming beach area is considered adequate for now.

b. Projected User Demand. Using projected visitation, current planning and design criteria, and the procedures and guidelines outlined in the Institute for Water Resources' Research Report 74-RI (Estimating Recreational Facility Requirements, Volume IV), the projected recreation facility requirements through the year 2020 were computed and are presented in TABLE 6-6. According to the procedures noted above, deficiencies in the number of

camping units and linear swimming beach are indicated. Only minor deficiencies are indicated for picnic units and boat ramp lanes. Further detailed evaluations will be required to substantiate the key facility demand levels identified by this planning methodology.

**TABLE 6-6  
SUMMARY: PROJECTED RECREATION FACILITY REQUIREMENTS**

<b>Facility</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
<b>Camp Units</b>	829	879	930
<b>Picnic Units</b>	125	133	140
<b>Boat Ramp Lanes</b>	63	67	71
<b>Swimming Beach (Linear feet of shoreline)</b>	1507	1599	1691

6.13 ENVIRONMENTAL AND ECOLOGIC CONCERNS

The need for the continued protection of the project's natural areas is a key concern. Potentially incompatible uses of these areas shall be prohibited.

Project management practices will be used to maximize the support value of the project for fish and wildlife production, while at the same time maximizing recreational opportunities for hunters and fishermen. Waterfowl management objectives will be fully coordinated with other agencies and should be consistent with the North American Waterfowl Management Plan. The lake's future potential for commercial fishing activity should not be over-looked. The Corps needs to continually monitor the lake's water quality, and to alert regulatory authorities of identified sources of contamination and of the need for implementing rectifying measures to control such pollution.

Specific management practices formulated for the project's operations and maintenance will take into account the need to protect and enhance conditions for Federally-listed and state-listed endangered species provided in TABLE 6-7. Additional observations and field study are needed to determine the presence or absence of endangered species. Management practices will also take into account carrying capacities for developed recreation areas. Management and maintenance practices will include regulating visitor numbers and erosion/site deterioration repairs.

TABLE 6-7

**FEDERAL AND/OR STATE THREATENED AND ENDANGERED PLANT AND ANIMAL SPECIES KNOWN TO OCCUR OR THAT MAY POTENTIALLY OCCUR WITHIN THE MARK TWAIN LAKE AREA\***

<b>Common Name</b>	<b>Scientific Name</b>	<b>State Status</b>	<b>Federal Status</b>
Bald Eagle	Haliaeetus leucocephalus	Endangered	Threatened
Indiana Bat	Myotis sodalis	Endangered	Endangered
Henslow's Sparrow	Ammodramus		Species of Concern
Greater Prairie Chicken	Tympanuchus cupido	Endangered	
Gray Bat	Myotis grisescens	Endangered	Endangered
Wild Sarsaparilla	Aralia nudicaulis	Rare	
Rock Pocketbook	Arcidens confagosus	Rare	
Prairie Dandelion	Microseris cuspidate	Rare	
Ghost Shiner	Notropis buchani	Watch List	
Hickorynut	Obovaria olivaria	Watch List	
Wartyback	Quadrula nodulata	Rare	
Ditch Grass	Ruppia maritime var rostrata	Extinct	
Meadow Willow	Salix petiolaris	Endangered	
Fat Pocketbook	Potamilus capax	Endangered	Endangered

\*Based upon information provided in the Missouri Heritage Database

## SECTION VII - RESOURCE USE OBJECTIVES

### 7.01 GENERAL

The purpose of this section is to define and prescribe a series of resource use objectives for Clarence Cannon Dam and Mark Twain Lake.

Resource use objectives are statements specific to Mark Twain Lake that provide general guidance and direction for the use, development, and management of project resources. The objectives listed below have been determined through study and analysis of regional needs, public input, and resource capabilities and potentials.

As stated in Section I, the authorized purposes for Clarence Cannon Dam and Mark Twain Lake are flood control, hydropower generation, recreation, fish and wildlife conservation, water supply, and incidental navigation. Certain project purposes, by their nature, can be conflicting. For example, under certain conditions, the flood control purpose of the lake can conflict with the other project purposes of recreation and fish and wildlife conservation. The development of sound resource use objectives increases user satisfaction and minimizes conflicts between project purposes through compromises that do not seriously detract from the achievement of any or all project purposes.

Resource use objectives based on project purposes at Clarence Cannon Dam and Mark Twain Lake are identified and discussed in the following paragraphs.

### 7.02 RESOURCE USE OBJECTIVES

Seventeen resource use objectives, applicable to the project, are presented below. They are formulated to provide general guidance and direction to the overall management and development of Clarence Cannon Dam and Mark Twain Lake resources. The objectives are grouped into three categories: General, Recreation, and Environmental Stewardship.

#### a. General

(1) Administration and Management. Ensure that quality administration and management of all project lands, waters and other associated man-made and natural resources are consistent and thorough. Seek to continually increase

efficiency, cost effectiveness, and innovation in projects while keeping public use and enjoyment as a goal as well.

(Discussion) All project administrative and management decisions/actions will adhere to all applicable laws, regulations, policies, and agreements. Consistent coordination, both internally and with other applicable federal, state, and local government agencies, private organizations and individuals, will be maintained.

All actions and/or plans will be implemented in a manner compatible with authorized project purposes and all applicable social and environmental factors to insure maximum benefits. Compromise will be used to minimize conflicts in project uses and development.

(2) Regional Economic Growth. Contribute to and develop partnerships with communities, agencies, groups, and individuals with the common goal of lake and regional tourism and economic development in the tri-state area.

(Discussion) The region around Mark Twain Lake is nationally known for being the birthplace and boyhood home of author Mark Twain. An effort to promote and develop upon both the historical significance of the area and recreational opportunities available can be most efficiently accomplished through the joint effort of the Corps and other groups, local communities, and individuals. The continued development of joint projects designed to inform and attract visitors to the region will benefit the entire area. Current associations with interested parties have proven to be very successful. The expansion of these partnerships will continue to increase area tourism and economic growth.

The use of partners to assist with the operation and management of the project will be fully employed. When feasible, donations and the challenge cost-share program will be utilized to accomplish work. Section 225 of Public Law 102-580 grants authorization to the Corps to enter into cooperative agreements with non-federal public and private entities to provide for operation and management of recreation facilities and natural resources at civil works projects. The Corps may accept contributions of funds, materials and services from non-federal public and private entities. The services of volunteers are accepted under PL 98-63 to carry out any activity of the Corps except policymaking or law or regulatory enforcement. Partnerships with the Tri-City Commission, the Missouri Department of Conservation, National Rifle Association, Missouri Equine Council, Mark Twain Lake Chamber of Commerce, Paris Lions Club, and other groups have provided great benefits to the public through additional facilities and special events.

Relationships with our partner agencies and local constituent groups will be maintained and strengthened; volunteers will be utilized maximally and our use of cooperating associations will be continued. If feasible, agreements will

be formed with local cooperating associations to assist with operations related to natural resource management, interpretive and visitor service activities.

b. Recreation

(1) Quality Recreational Experiences. Seek to increase the quality of visitor experiences by maintaining and developing purposeful, functional recreation areas that meet the needs of visitors while maintaining the aesthetic integrity of the environment.

(Discussion) Opportunities to improve the quality of recreation experiences are influenced by carrying capacity, compatibility of activities, and site-specific design factors. An aggressive maintenance program will continue to be used in order to maintain the quality of all recreational areas. Rehabilitation efforts designed to stop environmental degradation and facility deterioration will continue to be a top priority. A management goal will be to provide visitors with diverse and cost-effective recreation opportunities. Efforts will continue to be made to reduce the impacts of pool fluctuations on facilities and public use.

(2) Facility Management. Provide facilities that meet the needs of the visitors to the region. Maintain, develop and alter facilities in order to meet the changing and diverse use patterns of the visitors to the park. As funds become available, renovate and upgrade recreation areas to improve available facilities and reduce maintenance costs.

(Discussion) There is a need for providing visitors with a diverse range of day and overnight recreational opportunities. Four campgrounds, three group camp areas, two tent camping areas and a backpacking area provide accommodations for overnight visitors seeking a diverse range of camping needs. Current efforts are directed to upgrading electrical service to 50 amps and adding full service hookups in the campgrounds to accommodate visitor demand and stimulate visitation to the area. Numerous day use facilities managed by the Corps of Engineers and the Missouri Department of Natural Resources provide visitors with opportunities in boating, picnicking, swimming, and fishing. Two marina concessions provide visitors with additional opportunities. The need for additional concession services including resort and marina developments have been identified through market feasibility studies and efforts will be made to meet this critical demand.

All developed recreation areas designated for recreation use are regularly evaluated for the presence of safety hazards and environmental compliance with the Environmental Review Guide for Operations (ERGO) guidelines. As any detrimental conditions are identified, they will be given priority for evaluating and implementing feasible corrective actions.

(3) Barrier-Free Access. Increase outdoor recreational opportunities for the elderly, disabled, and other disadvantaged groups by providing barrier-free access and special programs to accommodate their needs. Continue to identify, build, modify, and redesign areas/facilities as mandated by Uniform Federal Accessibility Standards (UFAS) and Americans with Disabilities Act Design Guidelines (ADADG).

(Discussion) All persons must be given access to a wide range of outdoor recreation activities through careful and appropriate planning, design and program implementation. Accordingly, consideration is given to accessible facilities and services for disabled persons in the planning, design, and operations of existing recreation areas, and the development of future public use areas at the project. Shoreline fishing access for the physically challenged and the elderly continues to be a need that warrants attention. Efforts are underway to meet this need through the development of a small accessible lake in the Frank Russell Recreation Area and the construction of accessible fishing piers in the North and South Spillway Recreation Areas. Special hunts for the physically challenged are offered to enhance recreational opportunities for these needs.

(4) Interpretive Services and Outreach Program (ISOP). Strengthen the ISOP to foster stewardship and enhance public safety through promoting a greater public awareness, understanding, and appreciation of Mark Twain Lake and its natural and developed resources. Leverage project fiscal resources through the development of strong partnerships with state and federal agencies, local constituent groups, and with support of a cooperating association and volunteers.

(Discussion) The Mark Twain Lake ISOP includes the management of public affairs, community relations, marketing, publications, tourism, interpretive and environmental education programs, special events, and the visitor center. This program enhances the Corps of Engineers image, provokes public interest in Mark Twain Lake and the surrounding area, and promotes public safety.

All activities under the ISOP shall be designed to accomplish one or more of the goals listed in ER 1130-2-550, Chapter 4. In addition to visitor center exhibits, other tools used to enhance the ISOP include but are not limited to, programs both on- and off-site, news releases, a call-in information line, web site, brochures, fliers, posters, billboards, public service announcements (PSAs), off-project displays, newsletters, interpretive trails, and special events.

The use of partners to assist with the operation and management of Mark Twain Lake will be fully investigated and implemented when necessary. When feasible, donations, challenge partnerships, and volunteers will be utilized to accomplish work.

A relevant ISOP enhances the visitor's experience and enjoyment by anticipating their needs and providing interpretive resources to meet those needs. The ISOP can empower and provoke the public in a very effective manner and is critical to achieving success in fulfilling the Corps of Engineers stewardship missions. Once the public understands and appreciates the project resources, it can join forces with the Corps of Engineers to protect and preserve them. Through proper marketing and public relation techniques, the ISOP can effectively enhance the public's understanding of the resources.

(5) Environmental Protection. Continue to provide a rewarding experience for visitors by monitoring, maintaining, and improving the aesthetic and environmental quality of the area. Sites will be monitored and steps taken to prevent damage or rehabilitate areas before site impacts have any negative effects on visitors' experiences or the environment. Use of all areas for public enjoyment will be encouraged while minimizing any environmental degradation.

(Discussion) The development of recreational facilities and opportunities will not only satisfy the technical requirements of the effort but also incorporate environmental protection and enhancement techniques. Site designs, site hardening, impact deterrence, and natural landscaping will be used to accomplish this goal. Water quality in the lake is monitored at least four times per year. Boat and land patrols and reports from concerned citizens enable us to locate point and non-point source contamination areas.

(6) Special Events. Continue to support special events to serve the mission of the Corps and to promote economic benefits received by the region. This will be accomplished by continuing to provide special events annually as funding permits and through partnerships with other agencies and groups.

(Discussion) To promote public safety, the Corps will provide events such as "Mark Twain Lake Waterfest" and the "Women in the Outdoors" event as well as continuing to speak on safety issues on and off-site at all public contacts. Other events are staged to promote economical benefits to local businesses and improve tourism. The "Mark Twain Lake Rodeo" and the "North American Bullriding Association World Championship Finals" each attract approximately 20,000 visitors to the area each year. Events such as the "Primitive Artifacts Weekend", "An Adventure in Astronomy", the "Salt River Folklife Festival", "Missouri Mule Days" and the "Environmental Education Day" promote public awareness about environmental, scientific, cultural, and historical messages for the Corps and the local area. The following events may be pursued with interested partners to promote visitation and economic benefits to the region: farmers markets, car shows, and fishing tournaments.

### c. Environmental Stewardship

(1) Conservation of the Resource. Continue to monitor project resources to ensure protection against fire, overuse, abuse, off road vehicle activity, insect and disease infestation, encroachments, and trespasses. Corrective actions will be implemented to resolve problems.

(Discussion) We will strive to achieve environmental sustainability and recognize the interdependence of life and the physical environment. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems. Seek ways and means to assess and mitigate cumulative impacts to the environment. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work. Respect the views of individuals and groups interested in Corps activities and our projects. Listen to them actively and learn from their perspective in the search to find innovative solutions to the problems that also protect and enhance the environment. The partnership with the North Fork Watershed Group and the Clarence Cannon Wholesale Water Commission will continue with direction towards resolving water quality and erosion problems in the North Fork watershed and the entire Salt River watershed.

(2) Wildlife. Public land will be managed to encourage optimal utilization by the greatest number and diversity of wildlife species through the manipulation, management, and protection of habitats and ecosystems.

(Discussion) Management activities to provide food, nesting, and escape cover will include succession control through mowing, prescribed burns and agricultural practices, native grass, food plot, and tree plantings, and selective forest and wetland management practices. All management activities will be accomplished using applicable scientific and professional standards and practices. Habitat manipulation techniques and ecosystem approaches will be implemented to maximize the carrying capacity of various vegetative conditions. Erosion control and soil conservation practices will be utilized to improve water quality and watershed characteristics.

(3) Forest. Forestlands will be managed for multiple use to enhance their ecological, scenic, recreational, and wildlife values.

(Discussion) Sustained yield management will provide for diversity in all age groups and species composition. Inventories and prescriptions will be used to monitor and maintain forest cover for its scenic, recreational, water quality, fishery, and wildlife values. Silvicultural practices may be used for disease and

pest control, fire hazard reduction, habitat manipulation, and improvements to species composition.

(4) Cultural Resources. Identify, evaluate, and preserve significant archaeological and historical sites. Implement established procedures for inadvertent discoveries of Native American burials.

(Discussion) Continue to preserve and protect the “Crigler Mounds” National Register of Historic Places site and consult with the Missouri State Historic Preservation Officer as necessary. Continue to consult with the appropriate federally recognized Native American tribes as necessary. Numerous archaeological and historical sites were identified on Corps lands during various surveys. The implementation of the Historic Properties Management Plan will provide for these sites to be identified, evaluated, mitigated or managed for the benefit of future generations. Archaeological resources recovered prior to construction have been inventoried and are preserved at the University of Missouri-Columbia.

(5) Soils. All land management activities will be based on suitable soil types, soil characteristics and land use capabilities.

(Discussion) Use soil conservation practices that minimize the effects of wind, water, and mechanical erosion. Consult with the Natural Resources Conservation Service in the respective counties to evaluate and implement suitable management practices. Develop strategies that demonstrate sound public land stewardship in all Corps decisions. Conservation measures designed to prevent soil loss such as maintaining riparian corridors and grass waterways, stream bank stabilization, terraces, fertilization and turf renovation will be implemented on project lands.

(6) Wetlands. Establish, maintain, and protect high quality wetlands to improve water quality and provide habitat for wetland flora and fauna.

(Discussion) Development and maintenance of wetlands using moist soil units, the creation of opportunistic wetlands, strip cropping in suitable areas, and establishment of wetland plants will continue in support of applicable parts of the North American Waterfowl Management Plan and the project “Environmental Action Plan”. Management of the 3000-acre waterfowl refuge will continue in the Middle and Elk Fork branches of the lake. Wetland units in the re-regulation area will continue to be managed and maintained to demonstrate the additional benefits obtained from hydropower generation. Additional opportunities will be pursued with potential partners to derive benefits from projects on project lands.

(7) Fisheries. Maintain a viable fishery resource through monitoring and protecting water quality, enhancing fish cover/habitat, managing brood ponds,

stocking, supporting watershed management efforts, and coordinating with SWPA to maintain stable pool elevations during critical spawning periods.

(Discussion) Fisheries management efforts will be coordinated with the Missouri Department of Conservation. Fishing is the single most important recreation activity that influences visitation. Coordination efforts and management strategies will focus on optimizing a quality fishery and fishing success. Largemouth bass and crappie are the primary species that benefit the majority of visitors. Cooperative relationships with the power industry and the SWPA continue to provide opportunities to maintain stable pool elevations during the spring. Opportunities to fund research to determine the most beneficial way to obtain optimum population dynamics for target species will be explored with Cooperative Fisheries Research Laboratories, the Waterways Experiment Station, and other research institutions.

(8) Prairies. Manage native grasses and forbs to closely reflect remnant prairie ecosystems. Establish native grass and forbs plantings where necessary to maintain diversity of habitat and improve soil characteristics.

(Discussion) Prescribed burning with additional grass and forbs plantings will be used to maintain this remnant example of tall grass prairies that existed prior to early pioneer settlement. Existing native grass areas will be maintained through a schedule that includes periodic burns in order to halt woody invasion of the area. Emphasis will be placed on managing current acreage with minimal additional plantings where benefits are documented in habitat appraisal and evaluation techniques.

(9) Aesthetics. Plan and design all management actions and activities with consideration to visual enhancement, impacts, and aesthetics.

(Discussion) In order to provide the opportunity for a quality recreational experience, it is essential to consider the aesthetic impact of planned improvements as well as the economic and functional requirements. Each design, construction or maintenance action will be considered according to its visual impact to the environment.

Tree, shrub, forbs, and grass species used for landscape plantings and habitat improvements will be evaluated and selected based on aesthetics, food value for wildlife, cover and other qualitative vegetative factors. Native plant species with the greatest aesthetic appeal and wildlife value should be emphasized in plantings.

## SECTION VIII – RESOURCE PLAN

### 8.01 ZONING OF LAKE LANDS AND WATERS – LAND AND WATER USE

Recreational development at Clarence Cannon Dam and Mark Twain Lake has generally proceeded as planned in Supplement No. 1 of the original Master Plan for the lake. All project lands have been allocated for the authorized purposes for which they were acquired. Plate 1 depicts land allocations for all project lands. Allocated project lands have been further classified to provide for development and resource management consistent with authorized project purposes and the provisions of NEPA and other Federal laws. The land classification process refines land allocations to fully utilize project lands and takes into consideration public needs, legislative authority, regional and project-specific resource requirements and classification categories. Plate 2 depicts land classification categories for all project lands. Each classification category and the lands that are assigned to each category are described in the following narrative sections.

a. Project Operations. The objective of this resource allocation is to provide adequate land for safe and efficient operation and management of the project land and water resources for all authorized purposes. Lands zoned in this category include the main dam, the powerhouse, the outlet channel, the re-regulation pool and dam, and lands required for administrative and maintenance needs. Agricultural use of these lands will be permitted on an interim basis when it does not conflict with use for authorized purposes. The OPERATIONAL MANAGEMENT PLAN (OMP) contains further details on this land resource allocation and use. Seven areas are classified in this allocation and are depicted on Plate 2 and described in Section 8.02.

b. Recreational Lands The objective of this zoning classification is to allocate lands, by virtue of location and natural resources, to intensive recreational use. Park and recreation lands are developed to provide for the intensive recreational activities of the visiting public. Factors such as road access, natural resources, recreational facility design, and management practices make these lands conducive to accommodating public use. Lands in this classification include areas for existing, proposed and future commercial concessions, recreational development, and group use. Natural resources management objectives and techniques may be implemented within intensive use recreation areas to sustain and enhance biological communities and ecosystems, to prevent vector and disease problems, and to promote the scenic qualities of the area. Any agricultural use must comply with applicable soil conservation practices. Section 8.03 further details the development and use of lands in this zoning category.

c. Environmental Sensitive Areas (ESA) Lands classified as environmental sensitive areas contain significant scientific, ecological, cultural or esthetic features. These areas are normally located within one of the other classification categories and must be taken into consideration by management to insure the sensitive areas are not impacted by excessive activity or conflicting management objectives. Natural resource management objectives and techniques may be implemented within environmental sensitive areas with full consideration for protecting the ecological or cultural aspect of these areas. Limited or no development of public use is generally contemplated on land in this classification. Eight areas are classified as environmental sensitive areas. Of these, four are considered ecological areas (ES-1, etc.) and four areas considered cultural areas (CS-1, etc.). These areas are described in Section 8.04 of this Plan.

d. Multiple Resource Management The objective of this zoning classification is to allocate lands to one or more of the following uses based on their location and their natural resources: (a) recreation-low density, (b) wildlife management general, (c) vegetative management and (d) inactive and/or future recreation areas. Nine areas are classified as recreation-low density, and one area is classified wildlife management. These are described in Section 8.05. No lands were classified as vegetative management or future recreation.

e. Flowage Easement Lands Flowage easement interest was purchased for 9,740 acres to obtain the right to periodically flood these lands to achieve the project flood control benefits. These lands begin at elevation 620 feet NGVD and terminate at 642 feet NGVD.

### 8.02 PROJECT OPERATIONAL LANDS

The following paragraphs provide a brief description of all lands classified as Project Operations: Areas are depicted on Plate 2 and are described in a clockwise progression around the lake beginning at the main dam.

(1) 0-1. Main Dam/Saddle Dams and Outlet Works/Corps Management/Maintenance Complex. The Clarence Cannon Dam, powerhouse and outlet works are located in this area of approximately 260 acres. The Clarence Cannon Dam was built in two sections consisting of an earthen embankment approximately 1,100 feet long and a concrete monolith structure measuring approximately 845 feet in length. The concrete section includes the powerhouse substructure and a gated spillway section with four 50 feet by 39 feet tainter gates used for flood control. To the extent practical, all releases are directed through the hydroelectric generator turbines rather than the tainter gates. The crest of the dam embankment is at elevation 653 feet NGVD.

The project administrative area is located just north of the main dam. Facilities include the project office, a maintenance complex, a fenced vehicle

compound, material storage, fuel tanks, weather station, and employee/visitor parking areas.

Located downstream of the main dam in the Warren G. See North Spillway Recreation Area is the electrical switchyard which is owned and maintained by Northeast Power Cooperative in Palmyra, Missouri on lands leased from the Corps. The switchyard directs electrical power generated by the Clarence Cannon Power Plant to Northeast Power Cooperative transmission lines located east of the dam.

Two small earthen saddle dams with a total area of approximately four acres are located north of the Frank Russell Recreation Area.

(2) 0-2. Water Treatment Plant, Clarence Cannon Wholesale Water Commission. This regional water treatment plant is located four miles west of Florida, Missouri off of state highway Rt. U. This facility was constructed in 1991 and 1992. The production and sale of water to members began on June 16, 1992

The Clarence Cannon Wholesale Water Commission (CCWWC) entered into a three party contract with the US Army Corps of Engineers and the State of Missouri to purchase water storage space in Mark Twain Lake. The contract allows for removal of a maximum of 16 million gallons of raw water per day with an allowance for a failure rate of 2 years out of every 100 years for not being able to supply the full 16 million gallons per day. The CCWWC owns the rights to 5.0 million gallons of storage space, while the remaining 11.0 million gallons of water per day are available to them through contract with the State of Missouri.

The CCWWC facilities consist of a 4.5 million gallons per day surface water treatment plant, which uses flocculation, sedimentation, and filtration to purify raw water to acceptable standards for drinking purposes. In addition to the main facilities, the infrastructure consists of 236 miles of transmission mains, four booster pumping stations, a raw water intake structure located on the North Fork Branch of Mark Twain Lake, and daily storage space for 4.5 million gallons of drinking water.

The CCWWC currently serves the following cities and water districts: City of Paris, City of Perry, City of Shelbyville, City of Madison, City of Huntsville, City of New London, City of Farber, City of Vandalia, City of Curryville, PWSD #1 of Shelby County, PWSD #1 of Knox County, PWSD #1 of Marion County, Thomas Hill PWSD #1, PWSD #2 of Monroe County, Cannon PWSD #1, PWSD #1 of Audrain County, PWSD #1 of Pike County, City of Edina, City of Lewistown, City of La Belle, PWSD #1 of Lewis County. Associate members include; City of Clark, City of Baring, and PWSD #1 of Macon County. Expansion is underway to serve additional customers.

(3) 0-3. Land Irrigation Type Sewage Treatment Facilities, North Extension of Mark Twain State Park. Operated by the Missouri Department of Natural Resources, the acreage comprised by the facility is included in the

acreage figures for the state park lease with the Corps of Engineers for recreational purposes.

(4) 0-4. Land Irrigation Type Sewage Treatment Facilities, Indian Creek Recreation Area. - These sewage treatment facilities comprise approximately 26 acres and serve the Indian Creek campground, picnic area, group use area, and Indian Creek Marina. This facility is a no-discharge storage and irrigation system comprised of a two-cell aerated lagoon with an aerated vault waste tank and a 16.9-acre irrigation area.

(5) 0-5. Land Irrigation Type Sewage Treatment Facilities, John F. Spalding Recreation Area. - These sewage treatment facilities comprise approximately 20 acres and serve the facilities located at the Ray Behrens Recreation Area, Blackjack Marina, M.W. Boudreaux Visitor Center, John C. "Jack" Briscoe Group Use Area, Frank Russell Recreation Area, Mark Twain Lake Project Office, Clarence Cannon Dam, and the John F. Spalding Recreation Area. This facility is a no-discharge storage and irrigation system comprised of a two-cell aerated storage lagoon with a fourteen-acre irrigation area.

(6) 0-6. Re-regulation Pool. A total of approximately 1,766 acres of land and water located downstream from the dam are designated for project operations. These lands lie along both sides of the re-regulation pool over most of its 9.5-mile length. This area, downstream of the dam, is in the historic floodplain of the Salt River and was primarily acquired to enable operation of the re-regulation pool for hydropower operations. The re-regulation pool is used to store and regulate large releases of water from the generation of hydroelectric power and to store water for the potential use of the pump-back feature of the hydropower plant. This area was evaluated for wetland development as part of the North American Waterfowl Management Plan and contains developed wetlands constructed through the authorities of this plan and project resource use objectives.

The area along the re-regulation pool is also used for low-density recreational activities including fishing, boating, hunting, hiking, and nature study. Gravel roads, hunter/fisherman lots and two boat ramps provide visitors access to the area. A paved two-lane boat-launching ramp with an associated paved parking area is located just below the main dam in the Warren G. See South Spillway Recreation Area and provides visitor access to the western portion of the pool. A second one-lane paved ramp and associated Hunter/Fisherman Lot # 70 is located upstream of the Re-regulation Dam and provides access to the eastern portion of the pool. Hunter/Fisherman Lot #71 is also upstream of the Re-regulation Dam and provides walk-in access to the pool, several wetlands and a wildlife viewing tower.

(7) 0-7 Re-regulation Dam The Re-regulation dam is located 9.5 miles from the main dam and is in the Bluff View Recreation Area. It consists of a compacted earth embankment, a gated concrete spillway, a sluice, and an operating house. The dam and its associated structures comprise approximately 10 acres. The total length of the dam is 1,550 feet.

### 8.03 RECREATION AREA PLANS - FACILITIES DEVELOPMENT

A description of all recreational development at Clarence Cannon Dam and Mark Twain Lake is presented in this section. A total of fifteen areas are classified and zoned as intensive recreational areas. A summarization of development at these areas, both existing and future, is presented below. The following subparagraphs describe recreation areas in a clockwise order around the lake as shown on Plate 2, "Land Classification Map."

Proposed facilities are those facilities that may be completed within a ten-year period following the update and approval of this Master Plan. New proposed facilities are accompanied by a general cost estimate in Section XIII. A benefit/cost analysis is completed for new proposed facilities to justify their development.

The future plans provided in the area descriptions describe what may occur in the area beyond the ten-year time frame. All developments are subject to current rules and regulations applicable at the time of development.

The following 15 areas have been classified as recreation lands:

1. M. W. Boudreaux Recreation Area – Plate 3
2. Ray Behrens Recreation Area – Plate 4
3. Robert Allen Recreation Area – Plate 5
4. South Fork Recreation Area – Plate 6
5. Mark Twain State Park – Plate 7
6. Stoutsville Recreation Area – Plate 8
7. North Fork Recreation Area – Plate 9
8. Mark Twain State Park – North Extension – Plate 10
9. Shell Branch Recreation Area – Plate 11
10. Sandy Creek Recreation Area – Plate 12
11. Indian Creek Recreation Area – Plate 13 and 14
12. John F. Spalding Recreation Area – Plate 15
13. Frank Russell Recreation Area – Plate 16
14. Warren G. See Spillway Recreation Area – Plate 17
15. Bluff View Recreation Area – Plate 18

(1) M. W. Boudreaux Recreation Area. This 268-acre multi-use area is located on the east shore of the lake, just south of the main dam on Missouri State Highway J. The area is divided into two distinct sub-areas, one featuring the M. W. Boudreaux Visitor Center and the other a group use development.

The northern portion of this area contains the M. W. Boudreaux Visitor Center, which is a Class B Visitor Center with 2 overlooks; exhibit rooms and a 49-seat theater/conference room. Development in the area includes the Northeast Missouri Vietnam War Memorial, 14 picnic sites, 2 overlooks, a

universally accessible waterborne comfort station, a nature trail, an amphitheater and a paved parking area.

There are no proposed or future plans for the Visitor Center area.

The southern portion of this area was renamed the John C. "Jack" Briscoe Group Use Area and is developed for group use activities. Facilities in the group use area include 20 campsites with electric hookups, a shower building, a group picnic shelter, a nature trail, a playground, 2 combination fountain/hydrants, and a group fire ring.

There are no proposed plans for the group use area, but future plans include the addition of group campsites and a playfield.

A site plan that illustrates all development at the M. W. Boudreaux Recreation Area is presented on Plate 3.

(2) Ray Behrens Recreation Area. This 858-acre multi-use recreation area is the most highly visited area on the lake and provides a diverse range of facilities for boaters, picnickers, hikers and campers. The area is located on the south shore of the lake approximately eight miles north of Perry. The area features 165 campsites with electric hookups, a full service marina, a four lane boat launching ramp with an associated fish cleaning station and parking area, a courtesy boat loading dock, a 15-site picnic area that includes a group picnic shelter and the Lick Creek Trail Head with parking for trailers. Support facilities include 4 playgrounds, a potable water supply distribution system consisting of fountain/hydrant units, 2 overlooks/trilateration stations, an outdoor amphitheater, a fire ring, 4 shower buildings, 4 waterborne comfort stations, one waterborne comfort/changing station, a trailer dumping station, a fee booth, 3 nature trails, and a paved parking area for 156 cars and 170 car-trailers. An additional 240 car parking spaces are located adjacent to the full-service marina in this area.

An area near Blackjack Marina was identified as a cultural sensitive area and was protected.

Development approved in previous supplements but not yet constructed includes conversion of three campground comfort stations to shower buildings, conversion of 50 existing campsites to full service hookup sites, upgrade of 30 amp to 50 amp electrical service at individual sites, and an archery range in the day use area.

Proposed facilities include a 2-lane high-water boat ramp, a replacement fee booth equipped with a restroom and a floating breakwater for Black Jack Marina. Other proposed development plans include expanding the campground by 65 campsites with electric hookups and providing support facilities, i.e., 3 shower buildings, a playground, fountain/hydrants and 30 parking spaces. Due

to current visitor use and trends, this area was selected over the Indian Creek Campground as the preferred location for additional camping development. The breakwater will be funded by others.

Future plans for the area include the development of additional campsites and associated support facilities. Approximately 160 acres located in the northwest portion of this area is held in reserve for the potential development of resort concession facilities.

A site plan that illustrates all development at the Ray Behrens Recreation Area is presented on Plate 4.

(3) Robert Allen Recreation Area. This 1,083-acre area located on the south side of the lake about midway along the main body of the pool area has been developed as a multi-use area. Recreational developments include a 4-lane boat-launching ramp, 2 courtesy boat loading docks, a 2-lane high-water boat launching ramp for use at 625 feet NGVD and above, 3 picnic sites, a vault toilet, and parking spaces for 160 car-trailers and 10 cars. Included in the parking space total are 60 car-trailer spaces located in an overflow parking lot.

Proposed plans for this area include relocating the existing vault toilet above the flood pool at the next scheduled major repair and a fish cleaning station.

Future plans include the addition of group facilities and a vault toilet.

Approximately 207 acres located on the western most peninsula of the Robert Allen area north of Missouri State Highway 154, is being held in reserve for the potential development of a resort concession.

A site plan that illustrates all development at the Robert Allen Recreation Area is presented on Plate 5.

(4) South Fork Recreation Area. This 176 acre multi-use recreation area is located at the northeastern point of the South Fork of the Salt River as it joins the main body of the lake. Facilities located here include a 4-lane boat launching ramp, two courtesy loading docks, 3 picnic sites, a vault toilet, and a 120 car-trailer and 15-car spaces parking lot.

Proposed development includes a fish cleaning station, enlarging the parking lot by 30 spaces and relocating the existing vault toilet above the flood pool at the next scheduled major repair.

The area also has the potential to accommodate an additional commercial concession marina.

A site plan that illustrates all development at the South Fork Recreation Area is presented on Plate 6.

(5) Mark Twain State Park. Recreation Area 5, an area of approximately 1,073 acres, comprises the central portion of the 2,700-acre Mark Twain State Park and is leased to the Missouri Department of Natural Resources. The State Park contains 1,559 acres leased from the Corps of Engineers, while the remaining acreage is owned in fee title by the State of Missouri. Recreation Area 8 (Mark Twain State Park – North Extension) forms the northern portion of the park, while an area owned by the State of Missouri forms the southern boundary of the park. Existing development in Recreation Area 5 is shown on Plate 7, which includes a paved access road, a four-lane boat launching ramp, a 100-car and 145-car/trailer parking area, and a vault toilet. A visitor contact station is also proposed for development on state park property at the intersection of Highway 107 and Route U.

An area of land south of Recreation Area 5 is owned in fee title by the State of Missouri and is operated as part of Mark Twain State Park. This portion of the park contains a 103-site campground, a one-lane boat ramp, an overlook, 20 picnic sites, one playground, six miles of hiking trails, two picnic shelters, two washhouses, five vault toilets, one amphitheater, a scout camping area, fish cleaning station and a boat ramp parking lot.

Development proposed for this area includes four to six cabins in the existing campground, construction of a fee booth, development of 50 additional campsites, an additional washhouse, installation of electric service to campsites that currently do not have electric service and development of mountain bike trails in open areas and hiking trails in wooded areas just south of State Route U.

Future plans include a cabin development east of the Route U boat ramp.

(6) Stoutsville Recreation Area. This 486-acre multi-use recreation area has been developed for day-use recreational activities. The area is located on the North Fork Branch of Mark Twain Lake. A portion of the area has been developed for intensive recreational use while the remainder of the area is held in reserve for future development. Facilities located here include a 4-lane boat launching ramp, 2 courtesy boat loading docks, a high water boat launching ramp for use at 625 feet NGVD and above, 3 picnic sites, 1 vault toilet, 1 fish cleaning station, and 35 car and 145-car/trailer parking spaces. This area is periodically used as a training site for local National Guard and Reserve units.

Proposed plans for this area include relocating the existing vault toilet above the flood pool at the next scheduled major repair.

Future development planned for this area includes expanding the picnic area and support facilities. The area also contains a potential marina-concession site and a site suitable for future development as a beach.

A site plan that illustrates all development at the Stoutsville Recreation Area is presented on Plate 8.

(7) North Fork Recreation Area. This 703-acre area is located on the North Fork Branch of the Salt River adjacent to the southeastern portion of the Stoutsville Recreation Area. The area is zoned for recreational use with most of the site reserved for future development. Existing development is limited to a gravel access road, a 20 car-trailer parking lot, and a 4-lane boat-launching ramp.

Development previously approved for this area includes a vault toilet.

There is no proposed development for this area.

Future development planned for this area includes a paved access road, group picnic shelter, picnic sites, vault comfort station, and additional car and car/trailer parking spaces.

A site plan that illustrates all development at the North Fork Recreation Area is presented on Plate 9.

(8) Mark Twain State Park - North Extension. This area includes 486 acres of land leased to the Missouri Department of Natural Resources which comprises the northernmost portion of the Mark Twain State Park. Existing recreational facilities are shown on Plate 10, and include a 4-lane boat launching ramp with an associated 10-car and 120-car/trailer space parking area, two vault toilets, 13 picnic sites and a swimming beach with an associated changing house and parking area for 75 cars. Other facilities include the "Si" Colborn Group Camp with four barracks-style cabins, a washhouse, a kitchen and dining hall, an office/infirmary, swimming facility, play areas, and land irrigation sewage treatment plant.

This location was approved for marina development in 1995 at the request of the MDNR, but no marina development occurred. In 1998, the MDNR requested that the area be re-designated as a swimming beach and it was re-opened as such in 2000.

Proposed development includes an equestrian trailhead and parking area to tie into the Corps of Engineers Joanna Multi-use Trail, an equestrian campground, restroom facilities, and a fish cleaning station and associated parking near the Rt. 107 boat ramp. Also proposed is the completion of the Camp Colborn area to include 4 sleeping cabins, a washhouse and a recreation hall.

There are no future developments planned for this area.

(9) Shell Branch Recreation Area. The developed portion of this 377-acre area features a 4-lane concrete boat launching ramp, a 15 car-trailer parking lot and a courtesy boat dock.

There is no proposed development.

Future development includes a day use area with picnic sites, a picnic shelter, vault toilet, a large car/trailer parking area and a paved access road.

A site plan that illustrates all development at the Shell Branch Recreation Area is presented on Plate 11.

(10) Sandy Creek Recreation Area. Current recreational development in this 594-acre area includes an access road, a hunter/fisherman parking lot, a recreational fishing pond and a nursery pond.

A number of undisturbed Indian burial mounds were discovered in this area by a University of Missouri archaeological survey team and they are now known as the Crigler Mound Group Archeological Site. The site is listed in the National Register of Historic Places as provided by the Historic Preservation Act of 1966, Public Law 89-665.

There is no proposed or future development planned for this area.

A site plan that illustrates all development at the Sandy Creek Recreation Area is presented on Plate 12.

(11) Indian Creek Recreation Area. This 2,775-acre multi-use area is the largest recreational area on the lake. Located on a large peninsula in the east central portion of the north shore of the lake, the area is accessed from Missouri State Highway HH and an off-project county connector road. Several day use areas, a full service marina, a major campground, boat ramp, amphitheater/day use area, and a group camping facility are all located within this recreation area.

The main campground at Indian Creek features 190 campsites with electrical hookups, 20 hike-in tent camping sites, a single lane boat-launching ramp, and a beach. Support facilities include 5 shower buildings, 4 waterborne comfort stations, 2 playgrounds, a campground fee booth, 3 vault toilets, a system of hydrant/fountains, a fish cleaning station, and 2 trailer dumping stations.

A group camping area located outside of the main campground provides 25 trailer camping sites, 12 tent sites without electrical hookups, 1 shower building, 1 waterborne comfort station, a group picnic shelter, combination hydrant/fountains, and a playground.

Day use areas located within Indian Creek Recreation Area feature a 4-lane boat launching ramp with an associated fish cleaning station, two courtesy boat loading docks, a high water boat launching ramp for use at 625 feet NGVD and above, a waterborne comfort/changing station, a waterborne comfort station, a playground, a nature trail, 13 picnic sites, a full service marina, a group picnic shelter, an outdoor amphitheater with an associated fire ring, combination fountain/hydrants and a recreational fishing pond. A land irrigation sewage treatment plant and parking for 370 cars and 207 car-trailers support the entire Indian Creek Recreation Area. The marina area also features a 150-car parking lot and a 2-lane boat-launching ramp.

Development plans previously approved for the Indian Creek Recreation Area include adding showers to 3 campground comfort stations, conversion of 50 existing sites to full service hook ups, upgrading electrical service to individual campsites from 30 to 50 ampere, a primitive equestrian camping area at the day use area and relocation of the west boat ramp comfort station out of the flood pool. Expansion of the Indian Creek Campground by 75 trailer sites was proposed and approved in Supplement No. 7, *Additional Recreational Facilities Design Memorandum No. 9, The Master Plan, 1982*. Support facilities for the campsite development will include 2 shower buildings, one waterborne comfort station, 9 combination hydrant/fountains, a playground, and an additional campground fee booth. This expansion is still warranted; however, due to visitor trends and preferences, priority will be given to developing a newly proposed 65 campsite expansion at the Ray Behrens Campground.

Proposed development in this plan includes the development of a vault comfort/changing station near the existing Indian Creek beach, a playground, relocation of the east ramp vault toilet out of the flood pool, and a universally accessible fishing pier at Henderson Lake.

Future development plans for the area include the expansion of the concession area with overnight accommodations and an additional expansion of the campground.

A site plan that illustrates all development in the Indian Creek Recreation Area is included on Plates 13 and 14.

(12) John F. Spalding Recreation Area. This 506-acre multi-use recreation area is located eight miles north of the main dam on the northeastern end of the lake. Missouri State Highway J provides the primary access to the area. The area has been subdivided into two use categories. One area features a boat ramp and parking area and the second provides picnic facilities and a swimming beach. A project operations area, O-5, that includes a wastewater land treatment site and saddle dam is located in the easternmost portion of the Spalding area. The wastewater land treatment site provides services to all facilities on the eastern end of the lake.

A four lane concrete boat-launching ramp with paved parking area for 40 cars and 155 car-trailers is featured in a portion of this area. A gravel parking lot with a 20 car-equestrian trailer capacity and an associated universally accessible loading ramp provides access to the Joanna Multi-purpose trail that meanders through the western portion of the area. Support facilities at the boat ramp include two courtesy boat loading docks, a fish cleaning station, a 2-lane high water boat launching ramp for use at 625 feet NGVD and above, a combination fountain/hydrant, and a waterborne comfort/changing station.

Facilities for the swimming beach and picnic area include 2 picnic shelters, 1 picnic shelter with waterborne comfort station, 1 waterborne comfort station, 1 waterborne bathhouse, 1 playground, combination fountain/hydrants, 33 picnic sites, and parking for 430 cars and 30 car-trailers.

Development plans previously approved for this area include relocation of the bathhouse out of the flood plain.

There are no proposed plans for this area.

Future plans include setting aside a portion of the recreation area, approximately 200 acres in size, as a potential resort site.

A site plan that illustrates all development at the John F. Spalding Area is located on Plate 15.

(13) Frank Russell Recreation Area. This 578-acre recreation area lies adjacent to the northern abutment of the dam and has been developed primarily for camping. Currently the area contains 65 campsites with electrical hook-ups, a campground fee booth, one centrally located shower building, 3 vault toilets, 2 playgrounds, an amphitheater, several combination fountain/hydrants units, a fishing pier, a trailer dumping station, and parking for 10 vehicles. Other development within the recreation area includes a horse corral/shelter with access to the Joanna Trail, a universally accessible loading ramp, and a universally accessible fishing pond.

Proposed actions include the replacement of existing vault-toilets with water borne comfort stations, upgrading of electrical service to 50 amperes at individual sites and water and sewer hookups for 20 campsites. A portion of the Frank Russell Recreation Area is proposed as a potential resort site.

Future development plans for the area include additional campsites with electrical service, a shower building and comfort stations.

A site plan that illustrates all development at the Frank Russell Recreation Area is presented on Plate 16.

(14) Warren G. See Spillway Recreation Area This 226-acre recreation area lies contiguous to Clarence Cannon Dam along the north and south sides of the re-regulation pool and is accessed by Highway J. The Corps administration and maintenance compound form the northern border of the area. The area features opportunities for many day use recreational activities including fishing, picnicking, boating, shooting and special event activities.

Facilities on the north side of the re-regulation pool are in the Warren G. See North Spillway Recreation Area and include 1 vault toilet, 1 vault comfort station, several combination fountain/hydrants, 57 parking spaces, 5 universally accessible parking spaces and a playground. A parking area is provided for visitors to the Cannon Dam Power Plant Exhibit Area.

Recreational facilities on the south side of the re-regulation pool are in the Warren G. See South Spillway Recreation Area and include a 2-lane boat launching ramp, a vault toilet, a vault comfort station, an overlook, several combination fountain/hydrants, a playground, 45 parking spaces, 7 universally accessible parking spaces, 104 car/trailer parking spaces, a shooting range, and 2 group picnic shelters and a multi-purpose building with a no-discharge waste water infiltration system. This area is utilized as a special event activities area by a variety of groups and organizations.

The shooting range has been named in honor of the late Assistant Operations Manager, David C. Berti. The shooting range will be known as the David C. Berti Shooting Range.

Development plans previously approved for this area include universally accessible fishing piers, a waterborne comfort station/shower facility, a picnic shelter and an earthen berm with a concrete retention wall to support bleachers for the community activity area.

There are no proposed plans for this area.

Future plans for the area include development of a clay target shooting area and picnic sites.

A site plan that illustrates all development at the Warren G. See Spillway Recreation Area is presented on Plate 17.

(15) Bluff View Recreation Area This 45 acre recreation area is located downstream of the Re-regulation Dam and is developed for a variety of day use activities. Improvements in the area include a one-lane boat launching ramp, a group picnic shelter, 2 vault toilets, a playground, 4 picnic sites, and parking spaces for 83 cars and 20 car-trailers.

Proposed development plans for this area include a fish cleaning station.

There are no future development plans for this area.

A site plan that illustrates this development is presented on Plate 18.

### 8.04 ENVIRONMENTAL SENSITIVE AREAS

The following paragraphs describe the areas classified as environmental sensitive areas (ESA). These areas are depicted on Plate 2, and are described in clockwise progression around the lake beginning at the main dam. The zoning of cultural sites as environmental sensitive areas insures their protection.

Eight areas are classified as environmental sensitive areas. Of these, four are considered ecological sensitive areas (ES-1, etc.) and four areas are considered cultural sensitive areas (CS-1, etc.):

1. ES-1 Lick Creek Ecological Sensitive Area – Plate 2
2. ES-2 Quarry Lake Ecological Sensitive Area – Plates 2 and 6
3. ES-3 Indian Creek Ecological Sensitive Area – Plates 2 and 13
4. ES-4 Little Indian Creek Drainage Area (Joanna Ridge) Ecological Sensitive Area– Plates 2 and 15
5. CS-1 Hatten Mounds Cultural Sensitive Area – Plate 2
6. CS-2 Pollard Cemetery Cultural Sensitive Area – Plates 2 and 7
7. CS-3 Shell Branch Village Sites Cultural Sensitive Area – Plates 2 and 10
8. CS-4 Crigler Mounds Cultural Sensitive Area - Plates 2 and 12

(1) ES-1 Lick Creek Ecological Sensitive Area. The 1,404-acre Lick Creek Ecological Sensitive Area features a variety of natural attributes that make it a unique area in the Salt River basin. Vegetative and scenic qualities of the area make it an ideal location for ecological study. Extending southward along both sides of Lick Creek, on the east from the John C. “Jack” Briscoe Group Use Area and on the west from the Ray Behrens Recreation Area, the area is easily accessed by hikers and equestrian users. The 7 ½-mile Lick Creek Trail currently extends through a portion of the area. The diverse Lick Creek drainage area contains a broad cross section of the plant types found in the Salt River Basin. Of particular note is the Western Wall-Flower (*Erysimum capitatum*), found in 1974 on limestone outcroppings in this area. Many of the limestone bluffs provide scenic vistas of the lake. The area is managed to provide diverse vegetative structure for wildlife.

(2) ES-2 Quarry Lake Ecological Sensitive Area, South Fork Salt River. Located at the northern tip of the South Fork Recreation Area, the Quarry Lake Ecological Sensitive Area comprises 10 acres and features an abandoned quarry that forms a small clear lake. Surrounding the lake, 30-40 feet high vertical walls of limestone are reflected in the very clear water and many forms of aquatic life are visible. Although the lake is man-made, the overall scenic effect is of great interest and charm. Protection of this site will

preserve an area of striking beauty. The area is managed to provide diverse vegetative structure for wildlife.

(3) ES-3 Indian Creek Ecological Sensitive Area. The 987-acre Indian Creek Ecological Sensitive Area lies along both sides of the Indian Creek Branch of Mark Twain Lake. Ecological features of the area are noteworthy and will be preserved under this designation. The bluffs located in the area are largely wooded and feature a good representative cross section of the flora of this region of Missouri. Another feature of this ecological zone is an unnamed cave, which will be protected under this classification.

The Indian Creek Ecological Sensitive Area contains some of the largest expanses of native prairie grassland on the Mark Twain Lake Project. Prescribed burns are implemented to maintain the vegetative structure within the area. The area is managed to provide diverse vegetative structure for wildlife.

The area lies adjacent to the highly developed Indian Creek Recreation Area and affords visitors excellent opportunities for hiking and ecological study. A portion of the Joanna Trail runs through this area.

(4) ES-4 Little Indian Creek Drainage Area (Joanna Ridge). The Little Indian Creek Drainage Area comprises 1,232 acres and is located along the eastern shoreline of the Little Indian Creek Branch that is composed of diverse ecosystems. Scenic limestone bluffs rim the area, while the plateau areas above the bluff feature a glade type ecosystem with post oak, white oak, and red cedar as the dominant species. Ground cover species include patches of prairie grass, lichens and mosses. The southeastern portion of the area (S 1/2 Sec. 15, Section 16 T 55 N, R &W) provides an extremely interesting prairie remnant ecosystem of which Big Bluestem and Little Bluestem prairie plants are typical.

ES-4 consists of large tracts of warm season grass prairies, which are managed through a prescribed burn program. The area is managed to preserve its diverse vegetative habitat structure for wildlife. A portion of the Joanna Trail runs through this area.

Previously approved facilities for this area include a self-composting vault toilet, signs and bulletin boards. These facilities were not constructed because the service and maintenance entrance to the area was lost and the service and maintenance requirements could not be met.

(5) CS-1 Hatten Mounds. These mounds are located on the South Fork of the Salt River 1 ½ miles south of State Highway 154. Excavation has been done on both sites and identification indicates occupation since Archaic times (CA. 3,500 years ago). These salvage excavations, conducted by Dr. Dale R. Henning, were done between 1960 and 1962 under the auspices of the

University of Missouri. The mounds were used by Archaic and Late Woodland peoples.

Although the principal mound may be eventually restored, the hillside is expected to yield further burial sites and evidence of habitation. The location is beautiful, and provides a vista over the South Fork area.

(6) CS-2 Pollard Cemetery. This site is located east of State Highway 107 and north of the town of Florida. Three identified mounds make up the site. Members of the Pollard family are buried in the larger mound. These mounds are of interest to the archaeologist because of their proximity to numerous prehistoric villages. The vista is admirably located for viewing the lake and provides an opportunity for interpretation of the significance of Native American occupancy.

(7) CS-3 Shell Branch Village Sites. The Shell Branch Village Sites are located on the southernmost side of Shell Branch Creek where it enters Mark Twain Lake. Dr. Dale R. Henning (University of Missouri) tested these two sites in 1961. Both sites were extensively occupied, judging from the amount of surface material recovered. Although Archaic (CA 3,500 years ago) materials are found on both, the principal occupations appear to have been by Late Woodland Peoples. Evidence of funerary practices, food resource development and house form and use has come from these sites. The site yielded valuable archeological information and also is of great interest to the general public.

(8) CS-4 Crigler Mounds. These Native American burial mounds are known as the Crigler Mound Group Archaeological Site. The site was listed on the National Register of Historic Places in 1974 (Federal Register, Vol. 29, No. 108, June 4, 1974) and is located in Monroe County, Missouri, two miles east of the town of Florida in the undeveloped portion of the Sandy Creek Recreation Area.

The Crigler Mound Group Archeological Site is composed of seven mounds that were investigated by a University of Missouri survey team in 1960. Dr. Dale R. Henning was the field archaeologist in charge of the investigation. The mound group, known locally as "Crigler Cemetery", is possibly the largest and best-preserved group within the Mark Twain Lake project.

The zoning of these mounds as a culturally sensitive area ensures their protection.

## 8.05 MULTIPLE RESOURCE MANAGEMENT LANDS AREA DESCRIPTIONS

The following ten areas have been classified as Multiple Resource Management Lands with primary classifications as listed below. These areas are depicted on Plate 2 of this plan.

- (a) Recreation - Low Density
  - (1) ML-1 Lick Creek Multiple Resource Area.
  - (2) ML-2 Pigeon Roost Multiple Resource Area.
  - (3) ML-3 Allen Multiple Resource Area
  - (4) ML-4 North Fork Multiple Resource Area
  - (5) ML-5 Shell Branch Multiple Resource Area
  - (6) ML-6 Crigler Multiple Resource Area
  - (7) ML-7 Sandy Creek Multiple Resource Area
  - (8) ML-8 Indian Creek - Upper Drainage Multiple Resource Area.
  - (9) ML-9 Little Indian Creek Multiple Resource Area
- (b) Wildlife Management General
  - (10) MW-1 Upper End - Multiple Resource Area.

### Recreation - Low Density

(1) ML-1 Lick Creek Multiple Resource Area (MRA). The 560-acre Lick Creek MRA forms the southern boundary of public lands lying on Lick Creek east of State Route J, approximately one mile north of the town of Perry, MO. The area is characterized by a small area of bottomlands with steep bluffs or steep banks on the opposing side of the creek. Pool elevations lie within the confines of the historic creek channel. Included within the area is a hunter/fisherman parking lot and a one-lane boat ramp.

The original vegetation was oak-hickory forest on the uplands with bottomland hardwoods in the lower area and along drainages. Most of the lands were cleared and was either in pasture or row cropped prior to the formation of the lake. Since then the area is being allowed to revegetate. The slopes and drainages have remained forested and are in need of management due to the effects of previous poor land management practices.

The area is being managed to produce diverse vegetative habitat structure for wildlife. Hunting, fishing, and nature study are popular pursuits in this area.

(2) ML-2 Pigeon Roost Multiple Resource Area. The 1,609-acre Pigeon Roost MRA lies between the Ray Behrens and Robert Allen Recreation Areas and acts as a buffer zone between these two areas that have been developed for intensive recreational use. The area embraces the Pigeon Roost and Ely Branches, which flow into the lake from the south.

These lands were originally oak-hickory forest and approximately 1,100 acres are still classified as forest. However, most of this forest is second growth timber, occupying lands that at one time had been cleared for agricultural uses. The remaining areas are in various stages of succession and grasses.

The area is managed to produce diverse vegetative habitat structure for wildlife.

The area contains a gravel access road and a hunter/fisherman parking lot with a boat-launching ramp designed for small fishing boats. The lot and boat-launching ramp provide access for low-density recreational activities such as hunting, fishing, hiking, and nature study.

(3) ML-3 Allen Multiple Resource Area. The 345-acre Allen MRA lies between Robert Allen Recreation Area and Mark Twain State Park and acts as a buffer zone between these two areas that have been developed for intensive recreational use. Ground elevations range from the top of the conservation pool (El. 606 feet NVGD) to over 690 feet NVGD. The original vegetative cover in the area was forest. The tops of the ridges were cleared and farmed prior to the formation of the lake, but are now in various grasses, and successional stages. The slopes and drainages are currently forested. Hunting, fishing, boating, and nature study are popular recreational pursuits in the area. The area is also being managed to produce diverse vegetative habitat structure for wildlife.

(4) ML-4 North Fork Multiple Resource Area. The North Fork MRA comprises 643 acres and lies between the North Fork Recreation Area and the North Extension of the Mark Twain State Park. The area was covered with oak-hickory forest before the arrival of Euro-American settlers. With the settlement of the area, the land was mainly cleared for agricultural purposes and now is generally open except for forested drainages and small-forested tracts. Portions of the area were reforested after acquisition by the government. Other areas are managed under the agricultural lease program, as warm season grasslands or succession fields. The area is available for low-density recreation activities.

(5) ML-5 Shell Branch Multiple Resource Area. This 614-acre area lies between the North Extension of the Mark Twain State Park and the Shell Branch Recreation Area. The area acts as a buffer between the eastern edge of the state park and between private lands and the lakeshore. Gravel access roads provide continuous access for hunting, hiking, fishing, boating,

and nature study. The Shell Branch MRA also features a cultural resource site consisting of two Indian Village sites. (See description of CS-3.) These sites contain material from the Archaic period through the Woodland period with the principal occupation being in the Woodland Period. A prairie grass restoration area and a wildlife food plot are also located within this area. The area is also being managed to produce diverse vegetative habitat structure for wildlife.

(6) ML-6 Crigler Multiple Resource Area. The approximately 242-acre Crigler MRA lies between the Sandy Creek Recreation Area and the Shell Branch Recreation Area. The area is mostly forested and consists of a series of ridges with a southern aspect terminating in Mark Twain Lake. The area contains a minor access site with a gravel road and parking lot, and a trail to the lake. The area is used for hunting, fishing, hiking, and other low-density recreational pursuits.

(7) ML-7 Sandy Creek Multiple Resource Area. The 259-acre Sandy Creek MRA serves as a buffer between private lands and the Indian Creek Recreation Area. The area consists of a series of old agricultural fields interspersed with forested ridges. Originally, these lands were all oak-hickory forest. With the advent of the Euro-American settler, the areas suitable for agricultural purposes were cleared and cultivated. These areas now lie above the top of the conservation pool (El. 606 feet NVGD) but are well within the flood pool (El. 638 feet NVGD) and are maintained as openings for the purpose of wildlife management. The entire area is available for the low-density recreation activities.

(8) ML-8 Indian Creek - Upper Drainage Multiple Resource Area. The 517-acre Indian Creek Multiple Resource area comprises the upper limits of public land on the Indian Creek tributary to the lake. The area is comprised of an area of bottomlands with the lake being confined to its ancestral channel in all but flood stages.

The original vegetation was oak-hickory forest on the uplands with bottomland hardwoods in the lower areas and along stream courses. The uplands have been cleared and converted to agricultural purposes with the bottomlands being converted to pasture lands. The results of prior poor management practices are being corrected by allowing a portion of the area to revegetate naturally to more beneficial habitat.

The area is currently being managed for low-density recreation use. A portion of the Joanna Trail runs through this area.

An access lot was previously approved for this area.

(9) ML-9 Little Indian Creek Multiple Resource Area. The Little Indian Creek MRA lies along the Indian and Little Indian Creek branches of Mark Twain Lake and serves as a buffer zone between public and private lands. Comprising 867 acres, the area features plateaus and limestone bluffs. The plateau above the bluff consists of an upland hardwood forest with post oak,

white oak, and hickory dominant. The ground cover includes patches of prairie grass, forbs and a variety of secondary succession species. The area is currently being used for low-density recreation. The area is managed to produce diverse vegetative habitat structure for wildlife. A portion of the Joanna Multi-use Trail is located within ML-9.

(10) MW-1 Upper End Multiple Resource Area. An area encompassing a total of 14,536 acres, the Upper End MRA encompasses project lands west of the Stoutsville and South Fork recreation areas. The area includes all project lands found along the upper reaches of the North Fork, Middle Fork, Elk Fork, South Fork and Long Branch tributaries of the Salt River and thus contains a large amount of riparian lands as well as lands along the lakeshore. To facilitate a description of this diverse area, it will be divided into three sub-areas as follows: 1) South Fork and Long Branch sub-area, 2) Elk Fork and Middle Fork sub-area, and 3) North Fork sub-area.

1) South Fork and Long Branch Sub-area – The South Fork and Long Branch Sub-area extends southward on both sides of South Fork Branch from the South Fork Recreation Area (Rt. 154) to near the community of Santa Fe, Missouri. It includes the South Fork, Long Branch, and Brush Creek tributaries to Mark Twain Lake. The original vegetative cover in this area was generally forest; however, the tops of the ridges and areas with gentler slopes were cleared and farmed after settlement of the area. The marginal farmlands are now in various successional stages with some areas being managed for native warm season grasses. The flatter areas, which are not susceptible to flooding, are being managed under the agricultural lease program. The slopes and drainages remain timbered. The area is used for low-density recreation with hunting, fishing, hiking, and nature study being popular pursuits.

2) Elk Fork and Middle Fork Sub-area – The Elk and Middle Fork Sub-area includes the lands along the South and Middle Forks westward of the juncture of the South and Middle Fork branches. Originally, these lands were covered by forest; however, with the coming of Euro-American settlers, the flatter portions were cleared and used as farmlands or for hay and pasturelands. Now the marginal farmlands are in various grasses and successional stages with some areas being managed for native warm season grasses. The flatter lands, which are not susceptible to flooding, are being managed under the agricultural lease program. The steeper slopes and drainages are still forested.

A portion of this area is designated as a seasonal waterfowl refuge. The refuge is comprised of approximately 3,000 acres of land and water that have been set-aside as a resting area for the migrating waterfowl. Waterfowl hunting and boating is prohibited in the area from October 15 through December 31. The area remains open for other recreation pursuits.

3) North Fork Sub-area – The North Fork Sub-area includes lands along the North Fork west of the Stoutsville Recreation Area and Mark Twain State Park. It includes the Otter Creek, Crooked Creek, and Buck Creek tributaries to Mark Twain Lake. The North Fork Wetland Restoration Area is located in this area.

These lands were originally covered in oak-hickory forest; however, with the arrival of Euro-American pioneers, the areas suitable for agricultural use were cleared. After the construction of Mark Twain Lake, the more deteriorated areas became covered in grasses or woody growth. The steeper slopes and drainages are forested.

A tract of land (O-2) in the southern most section of this area near Mark Twain State Park is leased to the Clarence Cannon Wholesale Water Commission for operation of a water treatment plant. This area will be used for the plant maintenance corridor, road, and utility corridors.

The remainder of the area is available for low-density recreation activities.

## 8.06 IMPLEMENTATION

### a. Introduction

The means of accomplishing a development program is equally as important as the plan itself. Current national priorities limit development and renovation options more than in the past. At the same time, recreation visitation to Mark Twain Lake is no longer increasing at the annual rate of the 1980's, 1990's. Nevertheless, a need exists for the proposals contained in this Master Plan; and this need is expected to become greater in the future. It should also be recognized that changing priorities could drastically affect the manner and schedule for implementing this Master Plan. Hopefully, this Master Plan will have continuing utility despite any changing priorities that may affect its implementation.

### b. Implementation Methods

There are five basic implementation methods currently available for development at Mark Twain Lake:

#### (1.) Cost Sharing

Funding for cost sharing may well be more difficult to secure than in the past. In addition to providing at least 50 percent of the development cost of a proposal up front, the cooperating local governmental entity must also

agree to operate, maintain, and provide major replacements for the new development.

Requirements for cost sharing recreational development with non-Federal public interests will be considered when the need for such facilities can be sufficiently demonstrated.

The current Corps regulation, ER 1165-2-400 requires that all recreational developments be cost shared 50 percent by non-Federal public agencies. The non-Federal sponsor is required to enter into a cost sharing contract with the Corps prior to construction and agree to assume operation and maintenance responsibilities for the completed recreation facility. In addition, the non-Federal sponsor must agree to more than offset the annualized federal investment by assuming the responsibility for operation and maintenance of existing recreation areas operated by the Corps. There is one exception to this policy that permits the construction, operation and maintenance of new facilities without cost sharing. The one exception is the authority for upgrading sanitary facilities in existing Corps managed recreation areas to meet urgent sanitation needs in accordance with provisions of applicable state and federal laws.

This Master Plan does not contain any cost sharing proposals, but may in the future serve as a basis for initiating such actions. Any program proposals will be based on a letter of intent provided by the non-Federal sponsor and shall include: (1) estimated cost of the proposed development; (2) cost to be borne by the cost sharing sponsor; (3) method of repayment the cost sharing sponsor will use to match Federal funds; and (4) understanding of the cost sharing sponsor regarding assumption of operation and maintenance.

### (2.) Development Solely by Local Interests Under an Outgrant.

As in the past, local governmental entities with all or part of a project in their jurisdiction, may obtain use, under a lease or license. All costs are the sole responsibility of the local sponsor and operation, maintenance, and major replacement costs must be borne by them also.

### (3.) Regular O&M General Funds.

The use of Operation and Maintenance funds is restricted to normal O&M activities and when facilities are in need of total rehabilitation, consolidation, relocation or replacement. Changes or upgrades to facilities is restricted to current O&M funding levels for replacement or rebuilding of existing facilities.

(4.) Development by Concessionaire.

Another development method that could be used at Mark Twain Lake involves the implementation of some of the plans proposed in this Master Plan by a concessionaire. Only activities for which there is a viable commercial market are eligible. For developments undertaken in this manner; operation, maintenance, and major replacements are also provided by the concessionaire.

(5.) Challenge Cost-Share

The challenge cost-sharing program provides opportunities for public and non-Federal groups and individuals to contribute to and participate in the operation and/or management of recreation facilities and natural resources at Corps water resource development projects. Partnering with others provides a way to stretch the Corps of Engineers budget by sharing the cost of developing, operating and managing recreation facilities and natural resources.

(6.) Continuing Authorities Program (CAP).

The Corps of Engineers undertakes studies of water and related resources problems and opportunities as directed or authorized by Congress. These Congressional authorizations are contained in public laws, and in resolutions of either the House Public Works and Transportation Committee or the Senate Environment and Public Works Committee. Study authorizations can be unique, study-specific authorities, or they can be standing program authorities, usually called continuing authorities, under which specific studies and projects may be done. These studies are done at the discretion of the Secretary of the Army or the Chief of Engineers to address water resource related problems and opportunities and determine Federal interest.

Some continuing authorities are relevant to the Mark Twain Lake environmental stewardship mission and potentially applicable:

Section 206, Water Resource Development Act (WRDA) 1996 – Aquatic Ecosystems Restoration

This CAP authorizes small aquatic ecosystem restoration projects up to \$5 million in federal cost per project if it is in the public interest and cost effective. The project must be cost-shared (65 percent Federal, 35 percent Non-federal); non-federal sponsor is responsible for 100 percent of operation and maintenance (O&M) as well.

Section 1135, WRDA 1986 – Project Modifications for Improvement of the Environment

This CAP is intended for modifying structures and/or operations of existing Corps of Engineers constructed projects for environmental enhancement purposes, consistent with project purposes. Federal cost per project is limited to \$5 million and a non-federal sponsor must cost-share (25 percent) design and construction and is 100 percent responsible for O&M.

### Section 22, Planning Assistance to States (PAS)

Section 22, of WRDA 1974 authorizes the Corps of Engineers to assist states in preparing plans for the development, utilization and conservation of water and related resources of drainage basins within the state.

Requests from states arise from local identification of problems.

Typical studies are general in detail and do not include design for project construction. The program can encompass many types of studies including:

- Ecosystem restoration
- Water supply
- Water quality
- Water conservation
- Hydropower development
- Flood control
- Erosion and navigation

State allotments are limited to \$300,000 annually but generally are between \$10,000 to \$25,000.

### Section 216 – Flood Control Act of 1970 – Completed Project Review

Section 216 authorizes review and report to Congress of the operation of completed project when found advisable due to significantly changed physical or economic conditions.

The recommendations of the report may advise modifying structures or their operation, and improvements for the quality of the environment in the overall public interest.

# Mark Twain Lake Master Plan

## 8.07 Summary of Water and Land Use Classification

**Table 8-1**

Plate No.	Area No.	Location Name	Acres	
<b>Intensive Recreational Areas</b>				
3	1	M. W. Boudreaux Recreation Area	268	
4	2	Ray Behrens	858	
5	3	Robert Allen Recreation Area	1083	
6	4	South Fork Recreation Area	176	
7	5	Mark Twain State Park	1073	
8	6	Stoutsville Recreation Area	486	
9	7	North Fork Recreation Area	703	
10	8	Mark Twain State Park - North Extension	486	
11	9	Shell Branch Recreation Area	377	
12	10	Sandy Creek Recreation Area	594	
13,14	11	Indian Creek Recreation Area	2775	
15	12	John F. Spalding Recreation Area	506	
16	13	Frank Russell Recreation Area	578	
17	14	Warren G. See Spillway Recreation Area	226	
18	15	Bluff View Recreation Area	45	
			<b>Total</b>	<b>10234</b>
<b>Environmental and Culturally Sensitive Areas</b>				
2	ES-1	Lick Creek	1404	
2, 6	ES-2	Quarry Lake, South Fork Salt River	10	
2, 13	ES-3	Indian Creek Environmental Sensitive Area	987	
2, 15	ES-4	Little Indian Creek Drainage Area (Joanna Ridge)	1232	
2	CS-1	Hatten Mounds	*	
2, 7	CS-2	Pollard Cemetery	*	
2, 10	CS-3	Shell Branch Village Sites	*	
2, 12	CS-4	Crigler Mounds	*	
			<b>Total</b>	<b>3633</b>
<b>Multiple Resource Management Areas - Low Density Recreation</b>				
2	ML-1	Lick Creek	560	
2	ML-2	Pigeon Roost	1609	
2	ML-3	Allen	345	
2	ML-4	North Fork	643	
2	ML-5	Shell Branch	614	
2	ML-6	Crigler	242	
2	ML-7	Sandy Creek	259	
2	ML-8	Indian Creek Upper Drainage	517	
2	ML-9	Little Indian	867	
			<b>Total</b>	<b>5656</b>
<b>Multiple Resource Management Areas - Wildlife Management</b>				
2	MW-1	Upper End	14536	
			<b>Total</b>	<b>14536</b>
<b>Project Operations</b>				
2	O-1	Main Dam/Saddle Dams and Outlet Works/Corps Management/Maintenance Complex	260	
2	O-2	Water Treatment Plant, Clarence Cannon Wholesale Water Commission	*	
2	O-3	Land Irrigation Type Sewage Treatment Facilities, North Extension of Mark Twain Lake State Park	**	
2	O-4	Land Irrigation Type Sewage Treatment Facilities, Indian Creek Recreation Area	26	
2	O-5	Land Irrigation Type Sewage Treatment Facilities, John F. Spalding Recreation Area	20	
2	O-6	Re-Regulation Pool	1766	
2	O-7	Re-Regulation Dam	10	
			<b>Total</b>	<b>2082</b>
<b>Land Use Classification Acreage</b>				<b>36141</b>
<b>General Recreation Waters</b>				<b>18600</b>
<b>All Project Fee Lands and Waters</b>				<b>54741</b>

\* Acreage for these areas is included in other areas

\*\* Acreage for this area is included in acreage for Mark Twain State Park



## SECTION IX - FACILITY LOAD AND OTHER DESIGN CRITERIA

### 9.01 SITING

All proposed structures will be located above the 638 feet NGVD flood pool. Site selection will be based on environmental concerns including soil types and topography, existing forest cover, and relationship to other structures and utilities.

- a. Buildings. Buildings will be located to maintain as much aesthetic appeal as possible. Because initial recreation area development at Mark Twain was based on consolidated recreation areas, all future developments will be located near existing roads and utilities.
- b. Topography. The area topography consists of very steep hills and valleys at the lakeshore but relatively flat hilltops. These flat areas will be used for all proposed developments to reduce erosion and costs.
- c. Trails. Trails were sited in proximity to existing and proposed developments. Trails are generally located above the 638 feet NGVD flood pool elevation. They will take advantage of geologic and vegetative esthetics.
- d. Roads and Lots. Road and parking lots will be sited on flat terrain near existing road systems. For the most part, they will be in open areas. Where they are located in wooded areas, minimum clearing using natural drainage will be the standard.

9.02 CAMPING AREA ROADS - See Section 9.11

9.03 BOAT LAUNCHING RAMPS - See Section 9.11

9.04 PICNIC SHELTERS See Section 9.11

9.05 COMFORT STATIONS See Section 9.11

9.06 DAY USE SERVICE EQUIPMENT - See Section 9.11

9.07 SIGNS - All new signs will be installed, as required, by project personnel and will conform to the USACE Sign Manual (EP 310-1-6a and -6b), and the Graphic Standards Manual, EP 310-1-6.

9.08 INTERPRETIVE FACILITIES – M.W. Boudreaux and Power Plant Visitor Centers, nature trails, markers, visual aids, and displays are provided as required.

9.09 WASTE AND DISPOSAL - Trash and refuse collection and disposal services are contracted to private haulers.

### 9.10 WATER AND SEWER DESIGN CRITERIA

a. Waste Collection and Treatment. The present sewer system was designed in accordance with the Missouri Department of Natural Resources requirements and the criteria set forth in the Corps of Engineers EM 1110-2-400: Planning and Design Criteria, and other standards and conditions as required by the Corps of Engineers. The use of septic tanks and absorption fields has been recently added to the waste collection and treatment facilities at Mark Twain Lake.

Generally, sewers at Mark Twain Lake were located to obtain maximum use of gravity flow mains. The gravity flow mains, which are a minimum of 8 inches in diameter, are, for the most part maintenance free, have a design life of 50 years, and have adequate reserve capacity for any future developments at the lake project. Lift stations and pressure sewers were used when gravity flow was not practical due to the topography. The lift stations collected waste from a specific area and transferred, via pressure sewer, the waste to the nearest gravity system or treatment facility. The pressure sewers were sized at 4 inches, which provides an economical size and has large reserve capacity for any possible expansion of the lift station associated with the pressure sewer. Various types of pumping systems were used at the lift stations depending on the specific design requirements of each site. The lift stations can be expanded and upgraded without the need to alter any of the pressure sewers.

Lift station sizing was based upon wastewater being pumped within a 12-hour day with a peak flow factor of 2.5 times the average of 30 GPD per person for campers and 5 GPD per person for picnickers using waterborne toilets. The minimum size for pressure sewers was 4-inch diameter. Minimum discharge from the lift stations was based on maintaining proper velocities within the pressure sewer and minimizing detention times.

Wastewater treatment was designed in accordance with the requirements of the Missouri Department of Natural Resources and Corps of Engineers EM 1110-1-501 Process Design Manual for Land Treatment of Municipal Wastewater, and other standards and conditions as required by the Corps of Engineers. Facility loading was based upon all camping spaces fully occupied in a weekend day without any additional overflows permitted to occur during seasonal or holiday peaks. Peak population was based upon four persons per day for each campsite, and eight persons per day for each picnic table. Picnic sites were based on four persons per day with a turn over rate of two.

Initially wastewater treatment consisted of two land treatment sites, John F. Spalding and Indian Creek, and one package wastewater treatment

plant at Ray Behrens. The package treatment plant at Ray Behrens was eliminated and its wastewater is pumped to the John F. Spalding land treatment system. This required a sewer line crossing the lake at the Lick Creek arm of Mark Twain Lake. Land application has been found to be more economical with regard to operation and maintenance than the sewage treatment plant. Originally, land treatment systems did not require a National Pollution Discharge Elimination System (NPDES) operating permit as required by a package treatment plant. However, in the 1990's, state regulations changed requiring no-discharge waste treatment systems with flows greater than 3000 gallons/day to have a State Operating Permit under state regulation 10 CSR 20-6.015. Consequently, a permit application for both land treatment sites has been submitted. The land application method of treatment meets all federal and state requirements and provides a better level of treatment than the package treatment facilities and with proper maintenance can function beyond the typical 25-year design life of a package treatment plant. The land treatment system was based on a loading of 26 pounds of B.O.D./acre/day. Three septic tanks and absorption fields have been added to the waste treatment facilities at Mark Twain Lake. Two septic tanks receive waste from fish cleaning stations and one septic system services the Willingham Building.

b. Water System. Initially, water supply for the lake area was provided by a municipal source, the Ralls County Water District, using Perry Missouri's water treatment plant. The water system was a surface storage reservoir, which collected rainwater. The development around the lake increased water demand, and the Ralls County Water System was combined with the Monroe City Water System. This connection provided a loop for the two systems and improved the dependability of the water supply. Currently, water supply for the lake area is provided by the Cannon Water District. The Cannon Water District has a lease with the lake project to utilize and maintain the project's two 75,000 gallon elevated water storage tanks and several hundred feet of water distribution lines needed to operate their water distribution system. The Cannon Water District has contracted with the Clarence Cannon Wholesale Water Commission (CCWWC) to purchase water. The CCWWC water supply is obtained from Mark Twain Lake. The contract stipulates purchase of a minimum quantity of water. Once, the specified quantity of water is received, the Cannon Water District starts obtaining water from Monroe City Water Treatment Plant (WTP) due to cheaper rates. The Monroe City WTP withdraws water from their reservoir.

The water supply within the project site was based on providing a minimum of 20 p.s.i. residual pressure under peak flow conditions. The future water system modifications will focus on continued improvement of the present conditions.

Water demand within the project was based upon 30 GPD average per person assuming that all water consumed in one day was used within 12 hours. The maximum hourly rate of demand was based upon a peak factor of 2.5 times average flow. Water mains are not looped. Sizing of internal service lines

to buildings is based upon fixture unit flow requirements in accordance with the National Plumbing Code. Generally, lines are 2-inch, 3-inch, or 4-inch PVC pipe.

Water mains are sized at peak flows to maintain required residual pressures for plumbing fixtures with reserve capacity for future project development.

### 9.11 TYPICAL DRAWINGS FOR PROPOSED FACILITIES

Typicals for proposed facilities are shown below. Figures 9-1 to 9-3 present the components configured as a shower building. The shower building is composed of four modules. These modules can be configured in a variety of ways to create buildings such as comfort stations, mini-shower buildings, and comfort-change stations.

Figures 9-4, 9-5 present a standardized design for a comfort station and Figures 9-6 and 9-7 display the plans for a campground fee booth.

Figure 9-8 and 9-9 include typicals for a picnic shelter, amphitheater, playground, fishing pier, boat launching ramp, park road, campsite, camper hookups, fire ring, picnic table and grill.

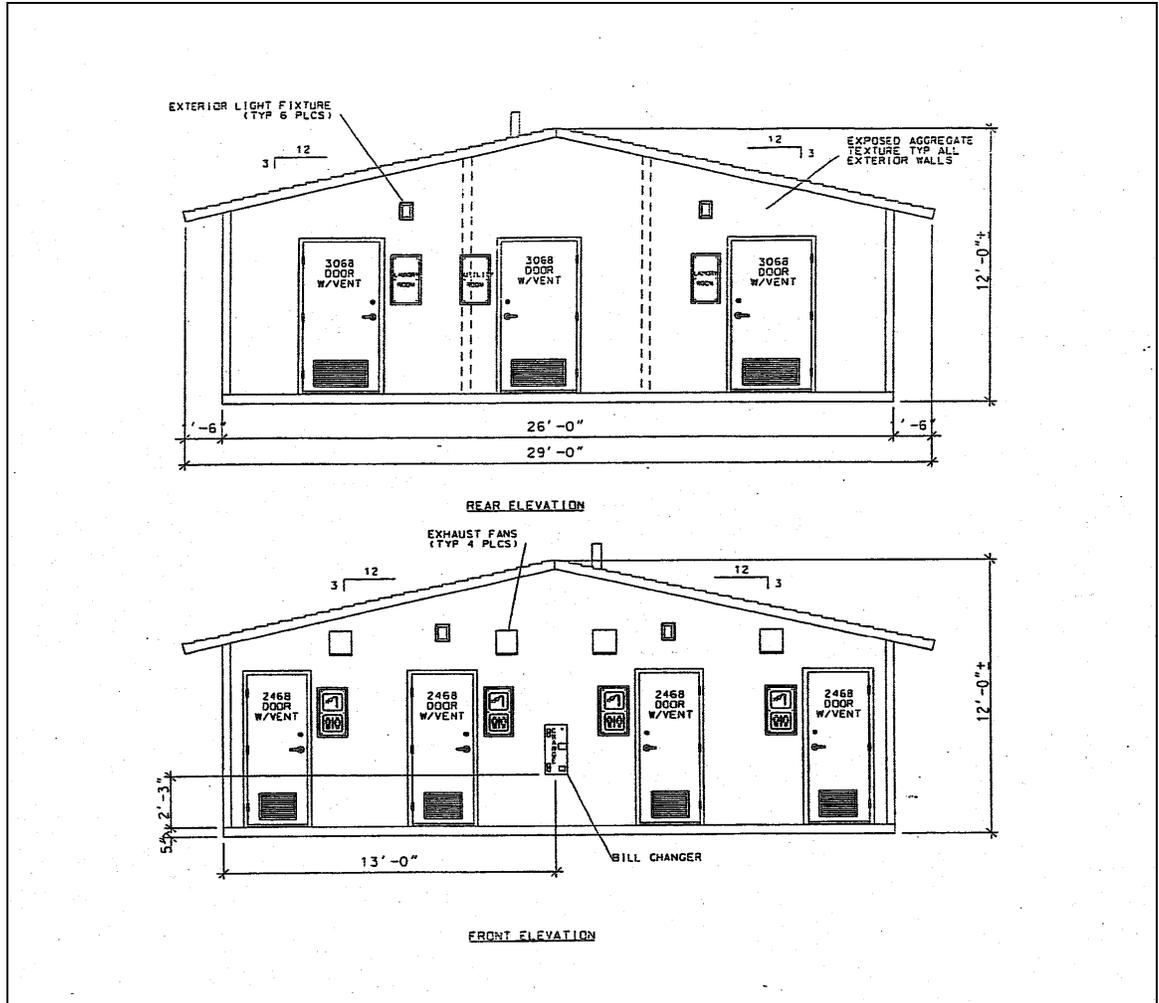


Figure 9-1. Typical Shower Building – Front Elevation



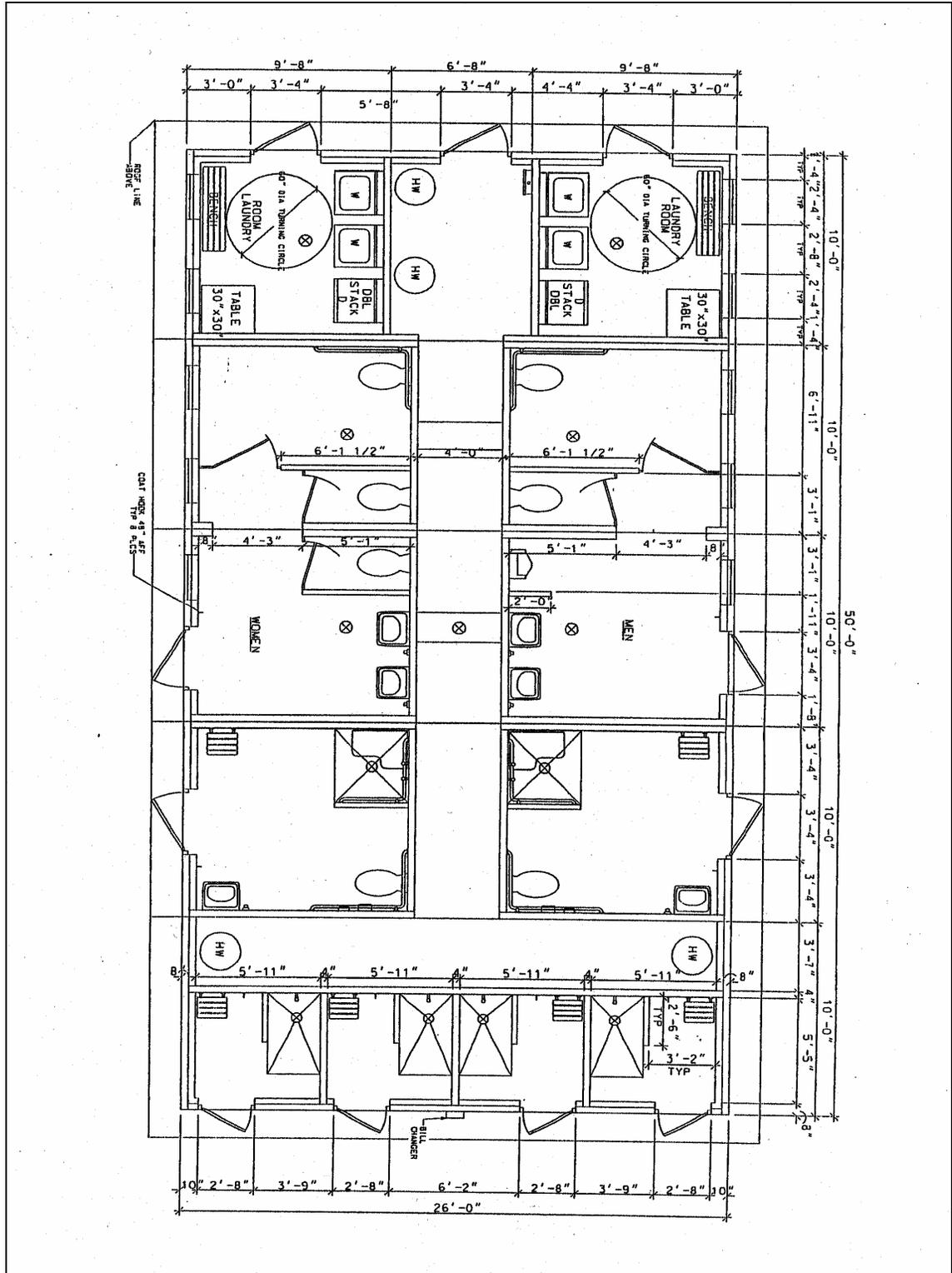


Figure 9-3. Typical Shower Building – Floor Plan





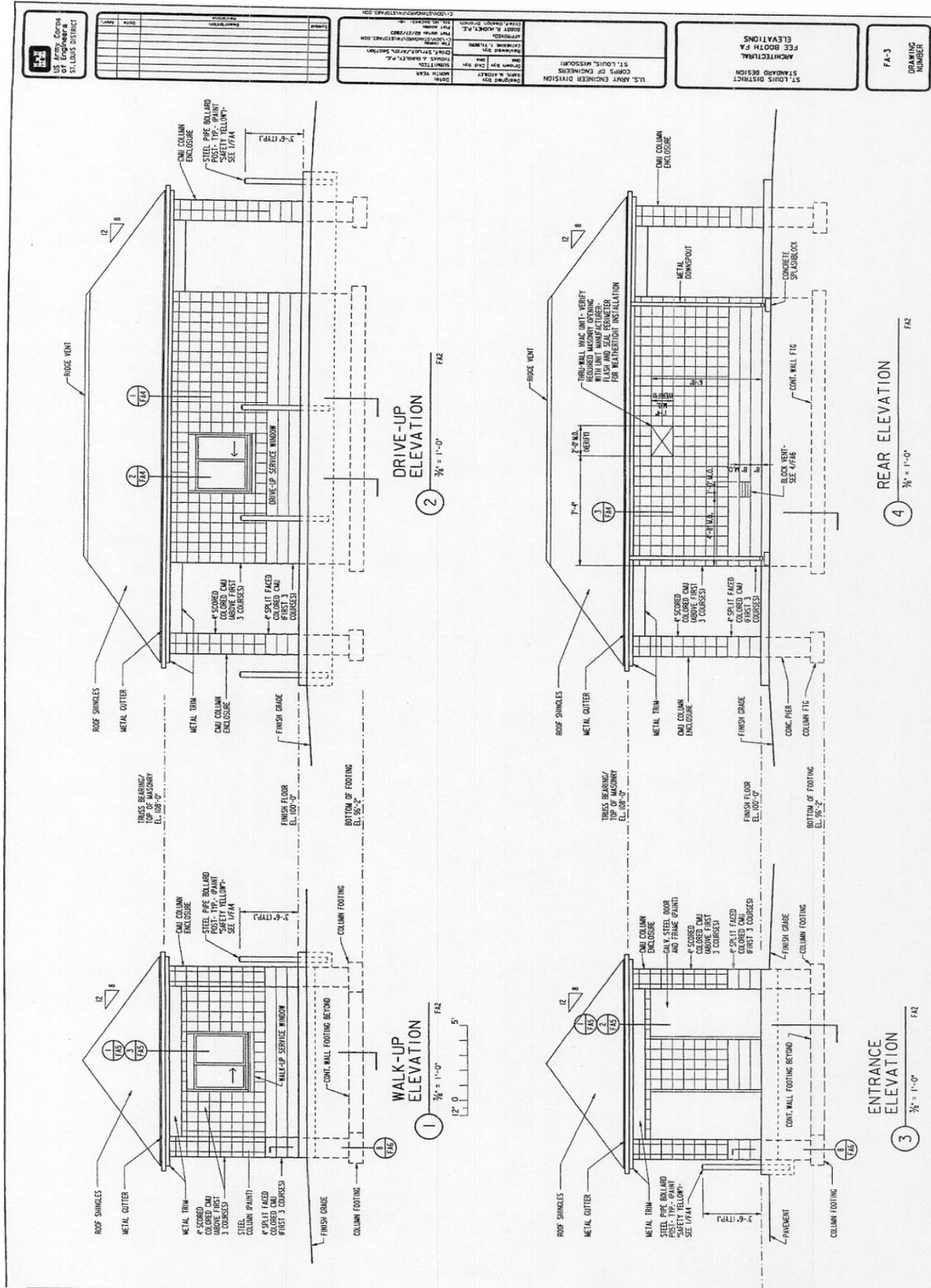


Figure 9-6. Fee Booth - Elevation



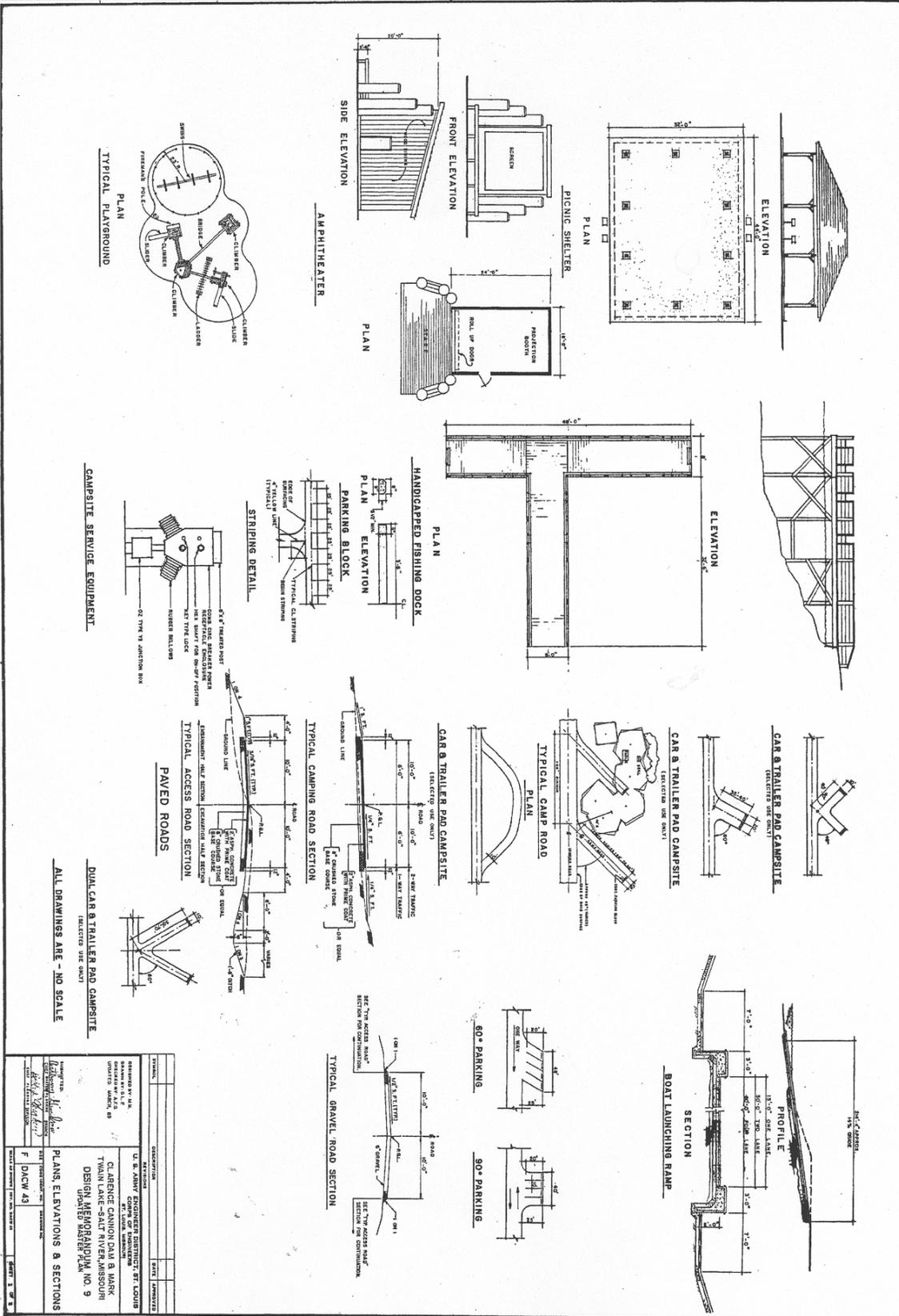


Figure 9-8. Miscellaneous Plans, Elevations and Sections

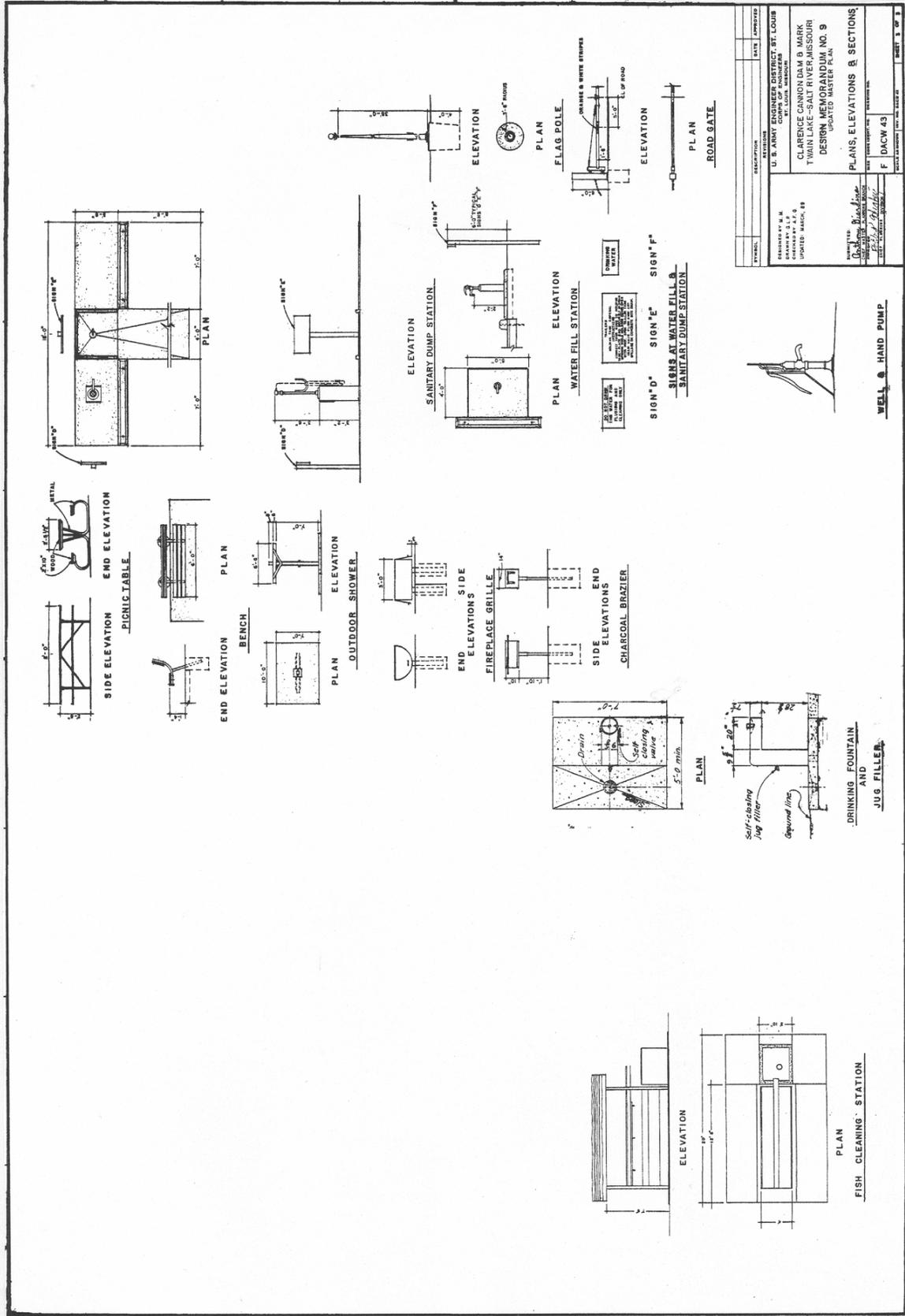


Figure 9-9. Miscellaneous Plans, Elevations, and Sections cont'd

## SECTION X – SPECIAL CONCERNS

### 10.01 COMMERCIAL RESORT DEVELOPMENT AND LODGING

Currently, the Mark Twain Lake Project has no lakeside lodging or resort development. Most of the commercial development that supports the project has occurred on private land, primarily along the eastern portion of the lake on State Route J, and in Monroe City and Perry, MO. Developments include campgrounds, a water park, convenience stores, bait shops and motels.

A January 2001 market feasibility study entitled “Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake, Missouri”, prepared by Parsons HBA for the Corps reinforced the need for lakeside lodging with ancillary marina facilities. The Corps of Engineers supports the opportunity to improve commercial development at the lake through private investment. Twelve potential commercial development locations on the shoreline were identified and evaluated in the study. A summary of the feasibility study is found in Appendix B.

The Corps supports commercial development at Mark Twain Lake and believes a key ingredient to improving future benefits and economic development in the area includes lodging and/or resort development on shoreline public lands.

### 10.02 FLUCTUATION OF LAKE LEVEL

Mark Twain Lake fluctuates throughout each year, depending on rainfall, watershed runoff, and water control operations. Because of the nature of the topography of the area, the lake has been documented to rise and fall more than 40 feet during a flood event. Rises of 20 feet or more are not uncommon. Several of the lake's recreation areas were developed based on anticipated use of the area and a frequency of high and low lake levels which were expected to be of a lesser magnitude than is now experienced.

As the level of the lake rises during a flood event, portions of public-use areas are inundated, thereby restricting their use. The degree and length of restriction depends upon the severity of the high water. High water has detrimental effects on project visitation, recreation and income to area businesses. Portions of recreational developments must be closed, with swimming, boat-launching facilities, marina accesses, hunter/fisherman lots, multi-use trails and access roads often inundated. Numerous county roads are

closed due to inundation, creating travel and access hazards for local residents. Fish populations could be adversely affected if spawning coincides with receding high water. Post-flooded areas are unsightly due to piles of debris and driftwood left behind. High water results in increased maintenance cost for repair and debris cleanup.

Low lake levels pose a different set of challenges associated with the operation of certain facilities and boating safety hazards, but generally do not affect visitation or closure of portions of areas. Underwater hazards that are inundated during normal pool elevations and above become hazardous to boaters. Blackjack and Indian Creek Marinas experience problems when their docks underwater structural members become damaged due to contact with the lake bottom. Both marinas have berthing slips that become unusable or inaccessible due to shrinking cove size during low lake elevations. The John F. Spalding, Indian Creek and Mark Twain State Park beaches have operational constraints at low lake elevations and are closely monitored to insure visitor safety. Several hunter/fisherman boat ramps become exposed and are unusable at low lake levels. Low lake levels may also reveal unrecorded cultural resources/archaeological sites that may require mitigation.

### 10.03 IMPACTS OF HIGH WATER ON RECREATION FACILITIES

In addition to the detrimental effects caused by high water described in the above paragraph, substantial damage is sustained to facilities that become inundated on a repetitive basis. Generally, most facilities need minor repairs and extensive clean up to prepare them for public use. However, repeated and prolonged inundations cause far more serious structural problems that lead to premature deterioration and failure. The bathhouse in the John F. Spalding Recreation Area and the comfort station at the Indian Creek west ramp are stacked block buildings that have been inundated frequently and are under careful evaluation. Both buildings become affected at the approximate lake elevation of 626 feet NGVD and their relocation out of the flood control pool was approved in a prior supplement to the Master Plan when major reconstruction is necessary. Vault toilets at the Robert Allen, South Fork and Stoutsville Recreation Areas are of wooden construction and begin to be affected at a lake elevation of approximately 632 feet NGVD. These buildings are proposed for relocation out of the flood control pool when major reconstruction is necessary. Additionally, a high-water boat ramp is proposed for the Ray Behrens Recreation Area due to the low elevation of the top of the existing ramp and the heavy public use of the facility.

Since 1993, numerous facility modifications have occurred to allow continued use of facilities during high-water events. Numerous transformers, electric connections and lift stations were relocated. High-water boat ramps were installed at the John F. Spalding, Robert Allen, Stoutsville and Indian Creek Recreation Areas to allow safe access to the lake. Additional

management practices that were and continue to be implemented to reduce the effects of high water on recreation facilities and natural resource areas include planting water-tolerant trees and grasses in flood prone areas and fields, raising low portions of access roads and designing facilities to withstand high water with minimal restoration and clean-up.

#### 10.04 BARRIER-FREE ACCESSIBLE SHORELINE ACCESS

The provision of a universally accessible fishing pier on the project shoreline is difficult with a pool fluctuation of over forty feet and the steep topography of the project. Due to these difficult conditions, development of lake-based disabled access has not been feasible. Lack of a disabled accessible fishing access is one of the most significant customer complaints that are received at the project office. In response to customer complaints, approval was obtained for installation of accessible fishing piers in the Spillway Recreation Area. Additional disabled accessible fishing facilities are provided at the recreational fishing pond within the Frank Russell Recreation Area.

#### 10.05 CAMPSITE AMENITIES

With the change in societal demographics and modern, technologically advanced, recreation vehicles, it has become necessary to upgrade campground amenities. Camping clientele and equipment have evolved from the more traditional camping experience to one that has all the conveniences of home. The most notable change has been the advancement of the recreational vehicle (RV). Modern RVs are equipped with dishwashers, microwaves, washers, dryers, satellite TV, multiple A/C units, water heaters and more. Safety issues have arisen and complaints have been received regarding electrical brownouts, thrown breakers and lack of full hookup (water, sewer and electric) sites. The initial phases of electrical upgrades to 50-ampere service have been completed in the Deer Run camp loop and a portion of Cedar Ridge in the Ray Behrens campground. Upgrading the camping units from 30-amp service to 50-amp service reduces operational maintenance; improves efficiency, and increases utilization and revenue. When the Ray Behrens campground is complete, work will begin at the Indian Creek Campground. Limited full-service hookups have been installed at existing campsites in the Ray Behrens and Indian Creek campgrounds. It is anticipated that additional full-service hookups will be installed.

A listing of backlog maintenance and repair items (BMAR) is identified and updated biannually in order to provide justification for supplemental funding. Although success has been limited, there has been increased interest at USACE Headquarters to program funds for these items nationwide. Prompt completion of all backlog items increases efficiency and customer satisfaction.

### 10.06 FISHERIES

A quality and sustainable fishery is one of the most desirable attributes that visitors look for at Mark Twain Lake. All interested parties and agencies must work together to attain this achievable goal. The regional economic success of Mark Twain Lake and surrounding communities is linked to a successful fishery. The Corps partners with federal, state and local governments, and with private sector organizations to advance aquatic resource conservation. These partners also work to enhance recreational fishing through habitat manipulations, stocking, monitoring, and recreational facility development. The MDC, in cooperation with the Corps of Engineers, conducts fish rearing for their stocking programs, stocking, creel census, development and monitoring of littoral zone habitat enhancement projects, and population surveys necessary to insure sufficient and desirable populations of fish species.

### 10.07 REGIONAL TRANSPORTATION

Lack of interstate access and improved four lane restricted access highways from major metropolitan cities and surrounding areas within the tri-state region hamper tourism growth in northeast Missouri and the Mark Twain Lake region. Recent improvements to the Mississippi River Bridge at Hannibal and the extension of Interstate 72 nine miles west to the Route 24 interchange will provide some minimal benefits. Route 36 is a two-lane highway that extends west past Macon, Missouri and continues to limit convenient access to the region from that portion of the state. Potential tourism growth is represented in southern Iowa, but funding difficulties with the improvements to Route 61, also known as "Avenue of the Saints", limit the opportunities to realize this growth. Additional tourism growth south and west of the region towards Columbia and Jefferson City can be realized with additional four-lane expansion on Route 54 from Mexico, Missouri. Continued improvements on Route 61 south from New London to St. Louis have increased visitation to the project. Completion of Interstate 72 in western Illinois has also augmented tourism from that region.

### 10.08 REGIONAL WASTEWATER TREATMENT

Expansion in the distribution of water through the Clarence Cannon Wholesale Water Commission has had positive impacts on the quality of life and growth in northeast region by addressing the need for a reliable potable water supply. Future needs must address other water quality issues such as the wastewater requirements necessary for additional growth. Watershed initiatives in the Salt River basin continue to demonstrate that the economies of many communities and continued growth in the area will be severely hampered until a regional wastewater system is provided to address these needs.

## 10.09 PROTECTION OF ARCHAEOLOGICAL RESOURCES AND INADVERTENT DISCOVERIES

Mark Twain Lake is particularly rich in cultural resources. Prior to impoundment, the project lands at Mark Twain Lake were extensively surveyed for archaeological and historic properties. Many prehistoric and historical period archaeological sites were inundated by impoundment of the lake. However, a significant number of cultural properties are located on public lands above normal pool. These properties are susceptible to damage occurring during normal operation and maintenance activities, from unauthorized artifact collecting, and from shoreline erosion. The *St. Louis District Historic Properties Management Plan for Mark Twain Lake*, September 1994, provides the guidance for the protection of cultural resources. The *Mark Twain Lake Historic Properties Data Synthesis* dated September 1995 may also be consulted.

A large number of recorded and unrecorded shoreline archaeological sites at Mark Twain Lake are in danger from many environmental influences. Erosion is the prevalent factor presenting the greatest risk to cultural resources; other factors include exposure to wave action, exposure to sun, and repetitive inundation. Exposed archaeological sites are subject to detrimental factors, such as unauthorized artifact collecting. It is essential to monitor the shoreline for recorded and unidentified archaeological sites in a methodical and efficient manner to document site condition and composition, and to facilitate protection of cultural materials. Pedestrian surveys are implemented to insure coverage of the entire shoreline during a five-year period, concurrent with Operational Management Plan updates.

The Corps of Engineers is mandated by the National Historic Preservation Act of 1966, as amended, to identify and evaluate all cultural resources on public lands where an undertaking may possibly impact cultural properties. Prior to operation and maintenance activities that may potentially impact cultural properties, the *St. Louis District Historic Properties Management Plan for Mark Twain Lake* will be consulted. This plan requires up to seven historic-preservation-compliance steps (see Chapter 3 in *Mark Twain Lake HPMP*) to be implemented to protect the integrity of cultural sites, depending upon the presence and nature of cultural properties, and upon their relationship to the proposed activity. The appropriate federally recognized Native American tribes might be consulted regarding the evaluation of cultural resources impacted by a proposed undertaking.

In the event of an “inadvertent discovery” at Mark Twain Lake, specifically when human remains are involved, the provisions contained within the Native American Graves Protection and Repatriation Act (NAGPRA) will be implemented. Lake personnel will document and protect the identified site, and notify the appropriate district personnel to initiate procedures identified in NAGPRA.

The Corps of Engineers is mandated “to preserve collections of prehistoric and historic material remains, and associated records, that are recovered in conjunction with Federal projects and programs under certain Federal statutes” (36 CFR Part 79, Curation of Federally-Owned and Administered Archeological Collections). Currently, materials (and associated records) collected on Mark Twain Lake lands are curated at the University of Missouri in Columbia, Missouri.

## SECTION XI – SPECIAL PROGRAMS

### 11.01 SECTION 1135 PROJECT

Section 1135 of the Water Resources Development Act of 1986 allowed modification of completed projects to restore environmental benefits. A potential fisheries habitat development project has been identified at Mark Twain Lake, but its feasibility is still being studied..

The fisheries habitat development project consists of improving littoral habitat quality for young fish that depend on shoreline structure. Quality fisheries habitat has declined with the increasing age of Mark Twain Lake. The shore area lacks structural complexity that would be provided by submerged aquatic vegetation or flooded terrestrial vegetation. Suitable littoral zone habitat facilitates predator avoidance and increases production of available prey for young fish, especially for largemouth bass. Poor habitat quality has resulted in decreased adult bass abundance and declining angler per catch unit. The Corps of Engineers proposes developing underwater habitat through the Section 1135 program in cooperation with the Missouri Department of Conservation. Cooperative opportunities may also be considered in the future for other aquatic/wetland resource projects through the Section 1135 program.

### 11.02 SPECIAL EMPHASIS PROGRAMS

Programs for youth, seniors and the disabled are an integral part of the recreation experience the Mark Twain Lake Project provides to the public. Volunteers provide most of the labor involved in support of these programs. In addition to a location for staging events, the project offers clerical and logistical support when appropriate. The special emphasis programs include, but are not limited to the following:

- (a) Boating programs.
- (b) Special hunts for game species, such as deer and turkey, in recreation areas where hunting is prohibited to the public.
- (c) Fishing Clinics.
- (d) Safety and Environmental Fairs.
- (e) Trail Rides.

These special emphasis programs do not prevent or interfere with the general public's recreation experience. Participation in these programs is limited to approved applicants and may be conducted in areas not specifically designated for such activities.

### 11.03 DIRECT FUNDING FOR HYDROPOWER MAINTENANCE

Direct Funding of Hydropower Activities – On October 28, 1999, a Memorandum of Agreement (MOA) was entered into by and between Department of the Army acting through the U.S. Army Corps of Engineers (Corps), the Southwestern Power Administration (SWPA), and the City Water and Light Plant of the City of Jonesboro, Arkansas which is part of the customer group served by SWPA. The purpose of this MOA was to establish a framework governing the respective activities at hydroelectric facilities of the Corps districts in the SWPA marketing region. The MOA was entered into pursuant to the War Department Civil Appropriation Act of 1936, the Flood Control Act of 1944, the Intergovernmental Cooperation Act of 1968, the Department of Energy Organization Act of 1977, the Water Resources Development Act of 1996, as well as relevant agency regulations and orders issued there under. Pursuant to this MOA, the parties shall enter into sub-agreements that will allow the Corps to accomplish properly identified and prioritized work items and will allow the customer group to provide funding through the City of Jonesboro for such work items. Such work items will include efforts for maintenance, rehabilitation, and modernization work at hydroelectric facilities owned by the Corps districts within the SWPA marketing region. Backlog maintenance projects that have been completed at the Clarence Cannon Power Plant include the “Rehabilitation of Intake Gates”, the “Replacement of Service Air Compressors” and the “Upgrade of Overhead Bridge Crane Electronic Controls”. Almost \$1.6 million in funding was provided through this MOA for these projects. Additional sub-agreements will address other maintenance work items that will greatly improve plant reliability.

In addition, direct funding of the routine operation and maintenance activities of the hydropower business function and the joint-use portions of project O&M work is being proposed under legislation in Congress and will be initiated through a MOA upon approval by Congress. This additional legislation will provide for the costs associated with the hydropower function to be funded through the MOA process by the customer group.

### 11.04 MULTI-USE TRAILS

Walking, bicycling, mountain biking, and equestrian-use activities are increasing on public trails. Statistics show that one-third of the public bicycles, more than half use walking trails, and in northeast Missouri, a large contingent use equestrian trails. The Joanna and Lick Creek multi-use trails have been

developed at Mark Twain Lake to meet these diverse user needs. In addition to normal trail activities, primitive camping and picnicking are available at identified sites to enhance the “outback” recreational experience.

The Joanna Trail begins at the John Spalding Recreation Area and travels along the north shore of the lake traversing oak/hickory forests with lake vistas, limestone bluffs, old fields and remnant prairies. The original trail was twelve miles long which included a one-mile connector trail to the Frank Russell campground. The trail was extended an additional 23 miles to Hunter/Fisherman Lot 16 in 1997. An additional 30-mile extension from Hunter/Fisherman Lot 16 to the Mark Twain State Park Boundary was approved for development in 1999.

The Lick Creek Trail begins at the trailhead across State Route J from the Ray Behrens Recreation Area and runs south along the shore of the Lick Creek Branch. The trail traverses terrain similar to the Joanna Trail and is eight miles long.

These trails have been developed and are maintained by numerous volunteers and formal partners. The Missouri Equine Council entered into a Challenge Partnership Agreement with the Corps to provide additional facilities and to maintain the two trails. Amenities such as disabled accessible loading ramps, bulletin boards, trail markers, a corral and a vault toilet have been made possible as a result of this agreement.

### 11.05 WATER SUPPLY

Mark Twain Lake serves as the single largest potable water supply in northeast Missouri. The Clarence Cannon Wholesale Water Commission (CCWWC) entered into a three party contract with the U.S. Army Corps of Engineers and the State of Missouri to purchase water storage space in Mark Twain Lake. This water supply, currently serving 20 rural water districts and communities is critical to the region’s economic vitality. The expansion of businesses and communities, state correctional facilities, and rural residences have been made possible by this regional utility and the expansion of its transmission lines. A detailed description of the CCWWC is located in Section 8.02.

The CCWWC was named the 2001 Conservation Organization of the Year by the Conservation Federation of Missouri in recognition for leadership in forming a regional coalition to promote watershed management and stewardship of the North Fork Watershed of Mark Twain Lake. The North Fork Project activities include developing workshops, publishing quarterly newsletters and hosting an annual regional watershed conference. The project also provides local leadership with information, resources and training about water quality issues, the impact of the community on watershed health, and

community based efforts to plan and manage water quality issues in the watershed.

### 11.06 USER FEES

PL 103-66, the Omnibus Budget Reconciliation Act of 1993, authorized the Corps to expand its recreation user fee program. The act authorizes the charging of user fees for day-use facilities. There is no authority for charging entrance fees at Corps operated recreation areas. Fees will be charged for the use of certain boat launching ramps and designated developed swimming beaches in Corps operated day-use recreation areas. Total day-user fees collected will be no more than \$4 per vehicle per day. A day-user fee of \$3 will be charged to launch a boat at a ramp in a Corps operated day-use recreation area. A fee will be charged at recreation areas having a boat ramp and one or more of the following facilities: rest rooms, picnicking facilities, swimming facilities, or other developed recreation facilities except where facilities are associated with a campground. No fees will be charged where only a boat ramp and courtesy dock exists or where ramps are located in undeveloped or lightly developed shorelines with minimum security and illumination. A day user fee of \$1 per person, whether walk-in or in a vehicle, up to \$4 per vehicle, will be charged for the use of a designated, developed swimming beach in a Corps operated day-use recreation area. An annual pass, (in lieu of daily charges), may be purchased for \$30 which permits the holder and all accompanying passengers in the vehicle to use any or all boat launch ramps and/or designated, developed swimming beaches at any Corps operated recreation area at any Corps project for that calendar year. An additional annual pass may be purchased for a reduced fee of \$15 for a second family vehicle. Only one duplicate pass may be purchased at the \$15 fee for each full price annual pass purchased. A Golden Age or Golden Access Passport shall entitle the permittee and any accompanying persons to a 50 percent discount on the day user fee.

### 11.07 ENVIRONMENTAL COMPLIANCE

Action and activities that the Corps proposes must comply with all applicable environmental laws and regulations. Chief among these is the National Environmental Policy Act (NEPA), which requires public officials to make decisions based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. Public involvement is to be encouraged and facilitated for decisions that will affect the quality of the human environment. Environmental consequences of proposed actions and alternatives are to be described in NEPA documents, which are circulated for public review.

According to Corps regulations, many of the items proposed in this Master Plan are categorically excluded from the need for preparation of NEPA documents, because they do not individually or cumulatively have a significant

effect on the human environment. Replacement or rehabilitation of existing facilities or construction of new facilities in developed recreation areas such as vault toilets, comfort stations, and picnic tables are examples of categorical exclusions. On the other hand, the preparation of an environmental assessment (EA) is required for actions that may have substantial environmental effects. Examples of such actions are: expansion of a campground into an undeveloped wooded area or construction of water control structures in natural habitats for the purpose of vegetation management. Before construction activities requiring an EA can proceed, the review of environmental consequences must conclude in a Finding of No Significant Impact (FONSI). If the review process results in a finding of significant impact, then an Environmental Impact Statement (EIS) needs to be prepared before construction can commence.

NEPA documentation will be prepared in the future for all actions proposed in this Master Plan that are not categorically excluded. It is the Corps policy to identify and avoid adverse impacts as early in the planning process as possible. Recreational and resource management projects will be designed to avoid and minimize adverse environmental impacts.

#### 11.08 PARTNERING

The Corps has control and oversight of stewardship activities on the public lands and waters at Mark Twain Lake. Responsibility for recreation management is granted to the MDNR at Mark Twain State Park. The MDC is only responsible for fisheries management.

Increasingly, competition for the use of project lands and waters and their natural resources can create conflicts and concerns among stakeholders. The need to coordinate a cooperative approach to protect and sustain these resources is compelling. Many opportunities exist to increase the effectiveness of federal programs through collaboration among agencies and to facilitate the process of partnering between government and non-government organizations.

To sustain healthy and productive public lands and waters with the most efficient approach requires that individuals and organizations recognize their unique ability to contribute to commonly held goals. The key to progress is building on the strengths of each sector, achieving goals collectively that could not be reasonably achieved individually. Partnering opportunities exist and can promote the leveraging of limited financial and human resources. Partnering aids the identification of innovative approaches to deliver justified levels of service, defuses polarization among interest groups and leads to a common understanding and appreciation of individual roles, priorities and responsibilities.

To the extent practicable, this Master Plan and a proactive approach to partnering will position the Mark Twain Lake Project to aggressively leverage

project financial and human resources in order to identify and satisfy customer expectations, protect and sustain natural and cultural resources and recreational infrastructure, and sustain Corps management efforts and outputs at a justified level of service. An overview of some of the key, long-term partnerships the Mark Twain Project Office is involved with relative to mission accomplishment is found In Section IV - Coordination with Other Agencies and the Public.

Memorandums of Agreement, Legislative Authorities for Partnering and Coordination, or both are established to define partnering arrangements with other agencies or organizations. These partnerships have become vital in providing the levels of service that users of project related resources demand. The Mark Twain Lake Project continues to seek new partnerships and strengthen existing ones to accomplish project initiatives

### 11.09 NATIONAL RECREATION RESERVATION SERVICE

The National Recreation Reservation Service™ (NRRS™) is a joint program of the Corps and other Federal agencies with outdoor recreational facilities whose purpose is to provide customers with access to one-stop shopping reservations for campsites and other recreation facilities managed by these agencies.

With over 49,500 camping facilities to choose from at more than 1,700 locations, the NRRS™ is the largest camping reservation service in North America. Facilities that are available for reservation at Mark Twain Lake include individual campsites, group camps and picnic shelters. It is Corps policy that 60 percent of campground sites be available for reservation.

Reservations for individual campsites, group campsites and picnic shelters can be made by telephoning the National Recreation Reservation Service's (NRRS) toll free number (877) 444-6777. They can also be made on the Internet at ReserveUSA.com or by contacting the campground fee booths in person (for individual campsites only). Customers making reservations are provided a variety of payment options including credit card, personal check or cash, credit card being the preferred method.

The following campgrounds offer reserved sites:

- Ray Behrens Campground -
- Indian Creek Campground -
- Indian Creek Group Campground
- Frank Russell Campground

- Jack Briscoe Group Campground (Formerly Boudreaux Group Campground)

#### 11.10 HOMELAND SECURITY

Clarence Cannon Dam and Mark Twain Lake operate under security measures defined by Army regulation. These measures are necessary to reduce risk to public and private property and to ensure security of facilities. Threatcon levels (Alpha, Bravo, Charlie and Delta) will be implemented depending on National and local threat conditions. If threatcon levels are elevated, access to public land, water and facilities will be restricted.

#### 11.11 MARKETING AND PUBLIC RELATIONS

The Corps public relations campaign focuses on enabling our visitors to appreciate and safely enjoy our developed and natural resources. Appreciation of the project's resources leads to improved stewardship by volunteers or members of partnering organizations in project activities. Through establishing relationships and cooperative alliances, the Corps fosters the support of neighbors, state and federal agencies, the local sheriff and law enforcement personnel, citizen groups, the local chamber of commerce, tourism agencies, and the general public to achieve the project's management objectives. A shared vision with community leaders, and federal, state, and local agencies can precipitate participation in challenge partnerships or funding to enhance the development and use of resources at Mark Twain Lake.

One aspect of a good public relations campaign is marketing, which is simply defined as a customer-focused way of doing business. Marketing involves a process of listening to our customers, then planning and providing products and services to meet their needs both efficiently and effectively within our capability. Valuing customer's input is vital to creating happy customers who return and tell their friends about Mark Twain Lake.

The Mark Twain Lake Operational Management Plan identifies the Corps specific marketing strategy and objectives along with target groups who can assist in achieving their three marketing goals: strengthening partnerships while seeking new ones to leverage project fiscal resources; using available resources to positively impact perceptions, knowledge, and behavior; and cooperating with efforts to identify opportunities to increase visitation and enhance economic impact to the region.

Ways to achieve these marketing goals can be as simple as a word-of-mouth referral or involve an intensive regional media campaign. The medium used to relay the message to potential customers or target audiences can include, but is not limited to, news releases, the call-in information line, web

sites, brochures, fliers, public service announcements, displays, newsletters, interpretive programs (both on- and off-site), word-of-mouth referral, sports shows, welcome and visitor centers, special events, and radio, television, and newspaper interviews.

The majority of customers to Mark Twain are from Missouri and Illinois. Mark Twain competes primarily with other recreation and vacation destinations within Missouri, namely Lake of the Ozarks. The mode of travel to and from Mark Twain Lake is typically via private vehicles. Thus, any action that affects the use of private vehicles will affect domestic pleasure travel to and from Mark Twain Lake. Reduction in the supply or increases in the cost of gasoline could affect private vehicle usage and domestic travel patterns and may restrict travel for some people. Through proper marketing and public relation techniques, local travel within the Midwest Region may be redirected to make Mark Twain Lake a recreational and vacation destination. The cities of Columbia and St. Charles in Missouri are dynamic economic growth centers and may be excellent locations to focus marketing.

Through an integrated public relations and marketing campaign, the Corps of Engineers will continue to work to increase the customer recall of Mark Twain Lake. To most effectively maximize the budget, the majority of the Mark Twain Lake promotional efforts will be focused on Illinois and Missouri. Partnerships with other entities, direct marketing, public relations, and the Internet will allow the Corps of Engineers to cost effectively reach beyond the primary market to other domestic travelers.

### 11.12 CORPS ENVIRONMENTAL OPERATING PRINCIPLES

The U.S. Army Corps of Engineers has reaffirmed its commitment to the environment by formalizing a set of "Environmental Operating Principles" applicable to all its decision-making and programs. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialogue on environmental matters, and ensure that employees consider conservation, environmental preservation and restoration in all Corps activities. Environmental sustainability can only be achieved by the combined efforts of federal agencies, tribal, state and local governments, and the private sector, each doing their part, backed by the citizens of the world. These principles help the Corps define its role in that endeavor.

Seven principles define the Corps environmental perspective:

1. Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse and sustainable condition is necessary to support life.
2. Recognize the interdependence of life and the physical environment. Proactively consider environmental consequences

- of Corps programs and act accordingly in all appropriate circumstances.
3. Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another.
  4. Continue to accept corporate responsibility and accountability under the law for activities and decisions under our control that impact human health and welfare and the continued viability of natural systems.
  5. Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of our processes and work.
  6. Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of our work.
  7. Respect the views of individuals and groups interested in Corps activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment.

The principles provide the Corps direction on how to better achieve its stewardship of air, water and land resources, while demonstrating the connection between water resources, protection of environmental health and the nation's security. By implementing these principles, the Corps will continue its efforts to develop the scientific, economic and sociological measures to judge the effects of its projects on the environment and to seek better ways of achieving environmentally sustainable solutions. The principles are consistent with the National Environmental Policy Act, the Army's Environmental Strategy with its four pillars of prevention, compliance, restoration and conservation, and other environmental statutes and Water Resources Development Acts that govern Corps activities. They will be integrated into all project management processes.

#### 11.13 ENVIRONMENTAL REVIEW GUIDE FOR OPERATIONS (ERGO)

Environmental compliance is solidly integrated into the day-to-day operation of the Corps of Engineers facilities. The Corps of Engineers use environmental compliance assessments as a means of attaining, sustaining, and monitoring compliance. Two types of assessments are conducted, external and internal. The compliance program requires annual internal assessments of each facility. Every five years an external assessment is conducted using district teams, contractors, or regulatory agencies.

Environmental compliance categories include, but are not limited to: management of air emissions, cultural resources, hazardous materials,

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hazardous waste, natural resources, pesticides, petroleum, oil, lubricants, solid waste, storage tanks, toxic substances, wastewater, and water quality. Documents that provide guidance include, but are not limited to the Environmental Review Guide for Operations (ERGO), ER & EP 200-2-3 Environmental Compliance Policies, 30 October 1996 and ER & EP 1130-2-540 Environmental Stewardship Operations and Maintenance Policies, 15 November 1996.

## SECTION XII - OPERATIONAL MANAGEMENT PLAN

### 12.01 INTRODUCTION

The Operational Management Plan (OMP), under separate cover, details implementation of several program areas only conceptually addressed in the Master Plan: recreation, shoreline management, forest management, fire management, fish and wildlife management and safety.

Master Plans and Operational Management Plans are developed and implemented with a view to their working in tandem. The Master Plan covers all resources of the project including, but not limited to, fish and wildlife, vegetation, cultural, aesthetic, interpretive, recreational, mineral, commercial and out-granted lands, easements and project waters (submerged lands held in fee). This Master Plan focuses on three primary components:

- Regional and ecosystem needs
- Project resource capabilities and suitabilities
- Expressed public interests and desires

The Master Plan ensures that environmental mandates and considerations are incorporated and that the economy and quality shall be given equal attention in the development of public facilities and support infrastructure. Usually, every ten years, the Master Plan is reviewed and updated and can be supplemented at any time when it becomes appropriate or necessary to do so. Based on an approved Master Plan, the Mark Twain Lake Project develops and implements an Operational Management Plan (OMP) to achieve the objectives stated in the Master Plan.

The Master Plan serves as the planning document that establishes the authority to act and the OMP is the implementation or action document that lays out the actual work, task schedules, costs and funding strategies for realization of the goals and direction set forth in the Master Plan.

Within the OMP, objectives and implementation strategies are established for each major area of emphasis: natural resource management, and park and recreation management.

The OMP, under separate cover, details objectives and strategies to implement programs based on Master Plan resource use objectives, and plans within the environmental stewardship, recreation and flood damage reduction business areas conceptually addressed in the Master Plan. Visitor assistance, public access, environmental compliance, interpretation and outreach, recreation safety, shoreline management, habitat management, fire protection

and fish and wildlife management, endangered species protection and facilities/infrastructure operations and maintenance are some of the major programs addressed in the OMP. During development or revision of OMPs, emphasis is given to achieving environmental mandates and other ecological imperatives of a national, regional or ecosystem nature. Emphasis is also given to achieving economy in planning, designing, constructing and managing natural and recreational resources, facilities/infrastructure and other services. Concepts are refined into actual work items with schedules and cost estimates for completion.

OMP management strategies must be consistent with authorized project purposes and approved resource use objectives and land use classifications established in the project Master Plan.

The OMP is dynamic in nature and includes funding, staffing and schedules required to implement management activities and strategies for the entire project. Approval for the OMP and all subsequent updates rests with the District Commander. Portions of the OMP (funding, staffing, equipment needs) are updated each year resulting in a set of work plans that are approved annually by the District Commander. All approved work is based on consistency with the OMP and is contingent on the availability of funds.

For outgranted areas, the OMP will include the outgrantees' management plans for the area and information on how the outgranted areas management supports the overall management objectives of the project. Cooperation and input from partners supporting management objectives and interested customers, organizations and the general public is encouraged during formulation and updating of the OMP.

Site-specific resource management recommendations are included in the OMP. The OMP divides the public lands surrounding the lake into management units called compartments. The compartments were selected using size, topography, land use classification, and access as location criteria. Management objectives are outlined for each compartment within the OMP. Development of the OMP is a concerted effort between Project and District personnel.

Key topics addressed under the main business areas (Environmental Stewardship Management, Recreation Management and Flood Damage Reduction) are listed as follows:

### Environmental Stewardship

- \_ Long Term Objectives of Resource Management
- \_ Compartment Descriptions
- \_ Topography (slope, aspect, general soil type, etc.)
- \_ Aquatic Resources (type, temperature, turbidity, etc.)

- \_Vegetation (species, size, density, etc.)
- \_Fish and Wildlife (species)
- \_Special Considerations or Problems (protected or rare/unique habitat, rare and endangered species, national emphasis programs (e.g., Watchable Wildlife North American Waterfowl Management Program and Neotropical Migratory Birds, etc.), pollution, forest fire control)
- \_Management Objectives (for each compartment)
- \_Implementation Plan (for each compartment)
- \_Management Techniques (to meet objectives)
- \_Five-Year Schedule (of management techniques to be applied)
- \_Annual Staffing and Equipment needs
- \_Annual Costs
- \_Coordination (with other elements/agencies/the public)

#### Recreation Management

- \_Safety (employee, contractor, and visitor)
- \_Security
- \_Visitor Assistance
- \_Shoreline Management
- \_Private Exclusive Use (existing approved regional plan may be inserted as is)
- \_Outgrants
- \_Maintenance
- \_Recreation Use Fee Program
- \_Interpretation
- \_Cultural Resources
- \_Project Sign Management Plan
- \_Special Programs
- \_Cooperation (with other agencies and/or special interest groups)
- \_Five-Year Program (for park management)
- \_Priority List (of annual programs with staffing and funding requirements)

#### Flood Damage Reduction

- \_Develop inventories and prescriptions for operation and maintenance of all federally owned and operated flood damage reduction infrastructure located on public lands and waters.

### 12.02 RECREATION

#### a. Scope

A detailed discussion of project recreation management is contained in the OMP. The guidelines and policies set forth in this section are the basis for preparation and implementation of the OMP relative to efficient recreation management at the lake. The OMP will be updated after approval of the Master Plan.

#### b. Goal

The goal of the lake recreation program is the efficient operation and maintenance of lake facilities to maximize public benefits and implement authorized project purposes. This is accomplished through the effective organization and utilization of manpower and materials.

#### c. Purpose

In the administration of the lake, management objectives contributing to lake efficiency and requiring the allocation of manpower and funding include:

(1) The provision of a wide range of outdoor recreation opportunities and facilities in a relatively natural setting.

(2) Reduction in conflict of use through activity and area zoning. The administration of lake lands as designated in paragraph 8-01, and on the Land Use Classification Map. (see PLATE 2).

(3) The provision for visitor information regarding natural resources and ecologic and cultural areas along with any other outstanding features.

(4) The development of policies which provide for maximum sustained public use without undue deterioration of lake resources.

(5) The provision of additional recreational opportunities through the issuance of leases to private individuals, state governments and other political subdivisions for concession and public park development.

(6) The maintenance of facilities and grounds to a high standard.

(7) The provision of a safe and rewarding outdoor recreation experience to the visiting public.

(8) The provision of populations of both game and non-game species so that all interest groups using lake facilities will have the opportunity of receiving

benefits from wildlife. SECTION VII includes, in greater detail, the goals and objectives of the Fish and Wildlife Management Program.

d. Staffing

The total staff for Operations and Maintenance assigned to Mark Twain Lake and Clarence Cannon Power Plant is 28.4 full-time-equivalents (FTE), including office, secretarial maintenance and management. An additional 8.0 FTE of STEP/SCEP is allocated per year.

The operations manager and staff are responsible for all aspects of operations, maintenance and administration of a water resource development project and its natural and cultural resources. The professional staff is responsible for natural resource management, outdoor recreation, administering service contracts, health and safety of visitors, pollution abatement, visitor assistance, boundary surveys and marking, working with state and local agencies and informing the public of Corps activities. Maintenance workers and contract personnel are responsible for maintaining and servicing the hydraulic structures, replacement of sand at beaches, realignment of protective buoys, erosion repair, seeding, fertilizing, tree and shrubbery planting, maintenance of trails, painting, repair of facilities (benches, tables and signs), road maintenance and repair, maintenance of comfort stations, shower buildings, miscellaneous facilities, and preventive maintenance particularly on all buildings.

### 12.03 FOREST MANAGEMENT

a. Scope

The policies and guidelines established in this section are the basis for the management of forested lands at Mark Twain Lake.

b. Policy

Forest resources at Mark Twain Lake will be managed in accordance with Public Law 86-717, the Forest Cover Act. Project lands “shall be developed and maintained so as to encourage, promote, and assure fully adequate and dependable future resources of readily available timber through sustained yield programs, reforestation, and areas for conservation, recreation, and other beneficial uses, provided that such development and management shall be accomplished to the extent practicable and compatible with other uses of the project.” The Project also “shall provide for the protection and development of forest or other vegetative cover and the establishment and maintenance of other conservation measures...so as to yield the maximum benefit and otherwise improve such areas”.

### c. Plan Preparation

The OMP contains specific information regarding the forest management program in the Natural Resources Section. It is prepared through a coordinated District effort. The plan divides the land into workable compartments and provides a treatment prescription for each compartment in compliance with its land use classification.

### d. Forest Management Objectives

Forest management will be provided wherever opportunities exist to protect and/or improve vegetative conditions for timber, fish, wildlife, soil, recreation, scenic value, and water quality. Sustained yield programs should provide for overall diversity in age and species composition of trees. The forest resources will also require protection from insects, disease, wildfire, and overuse.

The extent of management practices is largely dependent upon land use classification. General management considerations based on land use classification are described below:

1. **PROJECT OPERATIONS** -This classification includes those lands required for the dam structure, operations center, office, maintenance compound, and other areas that are used solely for project operations.

2. **RECREATION** - Lands developed for intensive recreational activities by the visiting public, including developed recreation areas and areas for concession, resort, and quasi-public development. The nature of these areas require intensive management practices, including landscaping with appropriate native and non-native species that have adapted to the area, and are maintained by the application of current arboricultural practices.

3. **MITIGATION** - Land acquired or designated specifically for mitigation. These lands are classified under Wildlife Management General.

4. **ENVIRONMENTAL SENSITIVE AREAS** - Areas where scientific, ecological, cultural, or aesthetic features have been identified (Environmental Sensitive Areas are designated as separate compartments). Normally limited or no development of public use is contemplated on land in this classification. Management of these areas is as follows: no forest management activities will be undertaken in these areas, except for the control of disease outbreaks and for wildfire suppression activities; timber removal will be made only with the purpose of providing access or for construction; trails will be allowed between "set aside" natural areas but no development will be allowed within the actual area; areas will be allowed to develop naturally without any outside influence. Any newly qualified sites discovered throughout the years will be recommended for designation through the Master Plan process. An attempt will be made to

designate a significant acreage to this allocation where the quality and uniqueness are great enough to dictate this designation.

5. MULTIPLE RESOURCE MANAGEMENT - Lands managed for one or more of, but not limited to, these activities to the extent that they are compatible with the primary allocation(s):

a) Recreation (Low Density) - Low-density recreation activities such as hiking, primitive camping, wildlife observation, hunting, or similar low-density recreational activities. Timber management activities in low-density recreation areas shall include: limited harvests, timber stand improvement activities, and forest manipulations to maximize wildlife habitat.

b) Wildlife Management General - Forest management activities for these areas shall provide for the protection and development of forest and vegetative cover. Management will be accomplished using practices such as artificial and natural regeneration, timber stand improvement (TSI), harvesting and prescribed burning. These areas are also managed to develop diverse habitat for both game and non-game species. Forest management practices will take full consideration of all wildlife habitat concerns, and will complement all natural resource management goals. Public use of these lands is limited therefore; forest management practices may take a more intensive scope.

c) Inactive and/or Future Recreation Areas - Recreation areas planned for the future or that have been temporarily closed. These lands will be classified as multiple resource management in the interim. Depending on the diversity of recreation planned (low-high), these lands will be managed accordingly.

6. FLOWAGE EASMENT LANDS - All lands for which the U.S. Army Corps of Engineers holds an easement interest but no fee title. The easement interest is the right to periodically flood these lands to fulfill the project flood control benefits. These lands begin at elevation 620 feet NGVD and terminate at 642 feet NGVD. These lands are not in fee title ownership by the Corps of Engineers, and therefore are not eligible for management activities.

#### 12.04 FISH AND WILDLIFE MANAGEMENT

##### a. Scope

The scope of this section is to establish guidelines for the management of the habitat and fish and wildlife populations currently present within the limits of the authorized project purposes.

##### b. Policy

The program objective is to provide diverse vegetative and aquatic habitat to be used by wildlife and fisheries populations of the Mark Twain Lake region. Management objectives shall be consistent with the needs of the public

and the objectives of the project. Natural resource management shall comply with guidance supplied in ER 1130-2-540 and EP 1130-2-540. Guidance pertaining to fisheries management will also be sought from Executive Order 12962 of June 7, 1995. The OMP shall document management strategies to achieve these objectives. Several purposes are included in the natural resource section of the OMP:

1. Evaluate current fish and wildlife habitats
2. Prescribe a course of action to maximize fish and wildlife populations commensurate with the carrying capacity of the resources available in the area.
3. Insure protection of resources in compliance with applicable environmental laws.
4. Evaluate success of implemented fish and wildlife management strategies, and provide for modification where necessary.
5. Maintain cooperation between the Corps of Engineers and other federal and state agencies in concert with the resource management programs.

Non-consumptive uses of wildlife, such as hiking and photography will receive equal consideration with consumptive uses, such as hunting and fishing. Vegetative and water manipulation, and augmentation of food resources are the principal methods of fish and wildlife management, and are consistent with other authorized purposes and physical limitations of Mark Twain Lake. Lake operation procedures are continually evaluated to support this program. Coordination is maintained with the MDC to establish criteria in support of favorable water elevations for fish populations.

### c. Wildlife Management Objectives

The objectives of the wildlife management program will be to provide diverse vegetative habitat to accommodate game and non-game species of the Mark Twain Lake Area. Management strategies will be in accordance with the authorized project purposes. The methodologies used will consider public use demands, environmental conditions, regional need and applicable state and federal laws. They will be implemented with accepted management techniques. A more exhaustive and detailed explanation of the resource management practices used is contained in the compartment prescriptions of the OMP.

Portions of several compartments are difficult to access, with private ownership being the only means of access other than by foot. Acquisition of road easements approved in Supplement No. 6 to Design Memorandum No. 9 will simplify access and facilitate the performance of habitat management, wildfire suppression activities, and boundary inspection and maintenance.

(1) Corps of Engineers Wildlife Management Program. Wildlife management objectives at Mark Twain Lake will be based on a stewardship concept of conservation and protection of natural resources for present and future

generations. It focuses on sustaining or enhancing ecosystems in order to maximize their potential. The application of the stewardship concept within ecosystems and their component biological communities is described in the following:

(a) Ecosystem Management An ecosystem is a dynamic community of biological organisms and the physical environment in which they interact. Ecosystem management at Mark Twain Lake shall be pro-active, goal-driven approach to sustaining and enhancing ecosystems and their values. Communities will be managed to promote regional environmental values occurring on project lands toward sustaining and enhancing ecosystems in which the project lands and waters occur. Such ecosystems and biological communities are identified in resource objectives and/or land use classifications contained in the MP and the OMP.

(b) Forest and Woodland Management Forest management at Mark Twain Lake will be managed in accordance with Public Law 86-717, Forest Cover Act, which provides a statutory mandate for multiple use forest management, or other vegetative management, on project lands and waters. Forest management will be applied to develop, maintain, protect, and/or improve vegetative conditions for timber, fish, wildlife, soils, recreation, water quality, or other beneficial uses. The OMP shall provide for sustainable yield forest management, reforestation activities, site specific prescriptions, implementation of improvement practices, recreation, and resource conservation compatible with other purposes of project lands.

(c) Wildlife Management The Corps of Engineers will conduct wildlife management activities at Mark Twain Lake, which seek to maintain or enhance wildlife populations, game or non-game species, through management of vegetative communities. Management objectives will be developed in a manner consistent with the guidance furnished in Section 2 of the Forest Cover Act, Public Law 86-717. Management objectives will be proactive and aggressive, seeking to provide positive impact and diversification on all applicable public lands. Special status wildlife species and wildlife species specified by laws and national focus plans/agreements, such as Endangered Species Act and the North American Waterfowl Plan will receive special emphasis in the OMP.

(d) Grassland or Openland Management The Corps of Engineers will provide for the management of grasslands and openlands at Mark Twain Lake, to include vegetative cover such as cool season/forb grasslands, warm season grasslands, and open lands in different stages of succession. Proactive and beneficial management techniques will be implemented whenever the opportunity exists to promote native grasslands or prairies, and/or improve vegetative conditions for such reasons as soil conservation, watershed protection, or fish and wildlife management objectives. Prescribed burning, mechanical manipulation, agricultural activities, and herbicide application are some tools that may be applied in the manipulation of vegetative communities.

(e) Wetlands Management The Corps of Engineers will provide for the management and enhancement of wetlands and other moist soil management

units at Mark Twain Lake. Wetlands are those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. On hydric soils and bottomland areas, consideration and management emphasis should be given to restoring and operating wetlands for wetland plant associations. The development and management of wetlands shall integrate the needs of fish and wildlife and support national programs and efforts associated with the Endangered Species Act and North American Waterfowl Management Plan.

(f) Soils Management All land management prescriptions developed for use at Mark Twain Lake will integrate the limitations and favorable characteristics associated with specific soil types and land use capabilities. Proactive and comprehensive prescriptions will be implemented for soil management, including erosion control, sediment management, and bank stabilization.

(2) Corps of Engineers Waterfowl Refuge An area comprising of 1,325 acres of water and 1,700 acres of land at a pool elevation of 606.0 NGVD is maintained as a waterfowl refuge on the Middle Fork and Elk Fork branches of Mark Twain Lake. The area will be closed annually to all waterfowl hunting and boat traffic between the dates of 15 October and 31 December, correlating with the established Missouri duck season. Management objectives will meet the needs for migratory waterfowl in concern with resting, cover, and feeding habitats. This area will be available for other consumptive and non-consumptive purposes, other than waterfowl hunting.

(3) Endangered or Threatened Species Several species of animals that appear on the Federal Endangered or Threatened Species list are known to occur or may potentially occur in Mark Twain Lake area including the Bald Eagle, (*Haliaeetus leucocephalus*), the Grey Bat, (*Myotis griseseens*), the Indiana Bat (*Myotis sodalis*), and the Henslow's Sparrow (*Ammodramus henslowii*). Management objectives will place emphasis on the management and protection on these special status species. Coordination with the MDC and other nature/wildlife organizations will be maintained to insure protection of identified species classified as endangered or threatened at the state level. Management plans will include identification and protection of specific sites, reintroduction efforts, and specific species management.

(4) Disease of Wildlife in the Mark Twain Lake Vicinity Lake personnel will be alert for evidence of wildlife disease or stress. In the event of a possible outbreak, lake personnel will coordinate with the St Louis District Office, U.S. Fish and Wildlife Service (USFWS), and the MDC area biologist. Sick or dead specimens will be delivered to the U.S. Department of Agriculture's Regional Diagnostic Laboratory at Centralia, Illinois or other suitable facility after coordination with the other appropriate agencies. The public will be notified of serious disease outbreaks through standard media outlets and procedures.

(5) Hunter and Hunter Control Hunting is permitted on all public lands except where prohibited. No hunting areas are designated by signs placed on the perimeters of the areas, and are shown on lake brochures. Rules and regulations pertaining to public hunting are contained in the Wildlife Code of Missouri published annually by the MDC.

(6) Physically Challenged Events Management objectives contained within the OMP will consider the needs of the physically challenged community. The Corps of Engineers at Mark Twain Lake conducts physically challenged special events (Fall Deer Hunt and Spring Turkey Hunt) in the Indian Creek Recreation Area. Hunting is normally prohibited in this area, but is open for hunting purposes during these physically challenged events for the event participants. The area offers a safe environment in which to implement this program.

(7) Missouri Department of Conservation. The MDC's responsibility is currently confined to the enforcement of the game laws stipulated in the Wildlife Code of Missouri.

d. Fisheries Management Objective

The objectives of fisheries management program will be accomplished using practices that will be in concurrence with the authorized project purposes. Methodologies shall improve the quantity, function, sustainable productivity, and distribution of aquatic resources for increased recreational fishing opportunities to the extent permitted by law and where practicable and in compliance with State and Federal laws. A more exhaustive and detailed explanation of fishery management practices used are contained in the compartment prescription in the OMP.

(1) Corps of Engineers Fisheries Management Program. All the fisheries and aquatic resources, including the lake, ponds, tributaries, and re-regulation pool within the fee title boundary line are included in the management objectives developed by Mark Twain Lake. Fisheries management objectives will focus on sustaining or enhancing aquatic ecosystems in order to maximize their potential, and enhancing recreational fishing opportunities. Corps of Engineers fisheries management objectives are described in the following:

(a) Aquatic Conservation - Foster sound aquatic conservation and restoration endeavors to benefit recreational fisheries. A temperature control weir, located in front of Clarence Cannon Dam at an elevation of 580.0 NGVD, draws water from the upper level of the lake. This is designed to keep the water releases through the dam into the Re-regulation pool as close as possible to the natural river temperature. The dam is equipped with four tainter gates used during high water periods and a concrete apron with force diffusers. The Re-regulation dam impounds a 9.5 mile pool downstream of the main dam to provide storage for pump-back power generation. Water level fluctuations in the main lake coincide with normal precipitation patterns and power generation

demands. During periods of high pool levels, water quality monitoring of the main pool and re-regulation pool is essential to maintaining sufficient water quality conditions.

(b) Recreational Fisheries Management - Identify recreational fishing opportunities that are limited by water availability, water quality, access, and habitat degradation and promote restoration to support viable, healthy, and where feasible, self-sustaining recreational fisheries.

(c) Nursery Pond Management – Provide supplemental sportfish for the waters of the Mark Twain Lake through the management and maintenance of a nursery pond.

(d) Partnerships – Developing, maintaining and/or encouraging partnerships between federal, state and local governments, and with private sector organizations to advance aquatic resource conservation and enhance recreational fishing through habitat manipulations, stocking, monitoring, and recreational facility development.

(e) Access - Providing access to and promoting awareness of opportunities for public participation and enjoyment of recreational fishery resources.

(f) Outreach - Support outreach programs designed to stimulate angler participation in conservation and restoration of aquatic systems, and encourage recreational fishing at Mark Twain Lake.

(g) Cost-Share Programs - Establishing cost-share agreements, under existing authorities, that match or exceed Federal funds with non-federal contributions.

(2) Endangered or Threatened Species. Species of aquatic life that appear on the Federal or State, Endangered or Threatened species list will be considered under fisheries management objectives that protect and enhance their special habitat needs in coordination with the USFWS and the MDC.

(3) Disease of Fish in the Mark Twain Lake Vicinity. Lake personnel will be alert for evidence of fish disease, or stress. In the event of a possible outbreak, lake personnel will coordinate with the St Louis District Office, USFWS, and the MDC area biologist. Sick or dead specimens will be delivered to the U.S. Department of Agriculture's Regional Diagnostic Laboratory at Centralia, Illinois or other suitable facility after coordination with the other appropriate agencies. The public will be notified of serious disease outbreaks through standard media outlets and procedures.

(4) Anglers and Angler Control. Fishing is permitted except where prohibited. Areas where fishing is prohibited are designated by signs and are

shown in the lake brochures. Rules and Regulations pertaining to public fishing are contained in the Wildlife Code of Missouri published annually by the MDC. Organized fishing events will be monitored and regulated by the MDC, Missouri State Water Patrol and the Mark Twain Lake Project Office.

(5) Missouri Department of Conservation - MDC in cooperation with the Corps of Engineers, conducts fish rearing for their stocking programs, stocking, creel census, development and monitoring of littoral zone habitat enhancement projects, and population surveys necessary to insure sufficient and desirable populations of fish species. The MDC has the responsibility to prepare, report, and update the Mark Twain Lake Fisheries Management Plan to encompass the findings in their studies and proposed management objectives.

## 12.05 SAFETY

### a. General

The Mark Twain Lake Safety program identifies common, recurring unsafe conditions and presents actions that will eliminate or reduce them in the OMP. The objectives of this plan expressed in general terms will be: to assign responsibilities for administration of a viable safety program, to establish programs for training and familiarizing personnel in all aspects of safety, and to present guidelines relative to employee safety and visitor safety.

EM 385-1-1, "Safety and Health Requirements Manual" and Engineer Regulations in the 385 series establish the safety program requirements for all Corps of Engineers activities and operations. Pertinent provisions of EM 385-1-1 and other applicable regulations are applied to all activities. Resource personnel have become familiar with these instructions and implement and enforce those provisions applicable to all Corps personnel, contract personnel and the visiting public. Other measures that are employed to maintain health and safety include, but are not limited to the following:

(1) The Operation Manager appoints a member of the project staff as the project and power plant safety officer. The project and power plant safety officer appoints a safety committee composed of representatives of the staff. The safety committee will develop plans and programs to carry out the provisions of EM 385-1-1 and the Engineer Regulations in the 385 series. The safety committee inspects randomly selected project facilities three times annually to ensure facility safety.

(2) Safety education lectures, meetings, hands-on activities, and videos are given to Government personnel by immediate supervisors and office personnel as required by EM 385-1-1. Semi-monthly safety meetings are conducted by project staff on variety of safety issues to encourage and promote safe working practices and personal protection. Prior to field work, "tailgate" safety meetings

are conducted with the work crews to reiterate safe practices and review immediate job hazards.

(3) Safety Award Program rewards employees for demonstrating a conscious awareness and participation in a safe work place. Employees successfully meeting the criteria of the Safety Awards Program throughout the year are eligible for a cash award.

(4) Resource management training courses and requirements comply with Section I and II of EM 335-1-1.

(5) The project safety plan portion of the OMP is used in program planning and operation.

(6) Project personnel promote, develop, and maintain public interest in recreational safety through the establishment of water safety councils. Personnel also participate in and take advantage of programs offered by organizations such as the National Water Safety Congress, National Safe Boating Council, MDC, Missouri Water Patrol, and the American Red Cross. Guidance and assistance is obtained from the District safety office.

(7) The Mark Twain Lake Project Office's partnership with area schools, local billboard company, Missouri State Water Patrol, Missouri Motorcycle Safety Foundation and Missouri State Highway Patrol actively promote water and highway safety.

(8) The Mark Twain Lake Water Safety Billboard Contest is a Corps promoted campaign to promote boating and water safety in the community. The billboard contest challenges area 7<sup>th</sup> and 8<sup>th</sup> grade students to create posters promoting water and boating safety. The winning poster is made into highway billboards displayed along major highways leading to the lake area.

(9) Visitor safety presentations include water safety demonstrations and special events at Corps beaches to promote safe boating and water recreational activities. Partnering with Missouri State Water Patrol during National Safe Boating Week, Corps employees assist with boat inspections and promotion of safe boating.

(10) Safety equipment and materials such as first aid kits; search, rescue and recovery equipment; portable signs and barricades; communications equipment; vehicles; motor launches; and fire fighting equipment are maintained at each project.

(11) Corps employees are trained in first aid, Cardiopulmonary Resuscitation (CPR) and Automated External Defibrillation (AED) in compliance with American Red Cross standards. First aid training includes basic courses and advanced first responders. Project personnel are certified American Red

Cross Instructors to promote project safety preparedness. Project owned AEDs are available for immediate emergency response.

(12) Restricted areas, swimming areas, danger zones, and hazardous areas are properly marked with the appropriate buoys, markers, signs, or barricades which conform to the current Corps Sign Standards (EP 310-1-6a,b) Such devices are placed and maintained to insure the public is adequately safeguarded against hazards. Tail water areas and areas immediately above spillways and dams are properly marked with signs, buoys, or other markers. Signs, buoys, and markers have been installed in connection with powerhouses, and outlet control structures. Project roads and boat launching ramps are adequately signed, marked, or barricaded for proper use and protection of the visiting public.

(13) All facilities and equipment comply with applicable Occupational Safety and Health Administration (OSHA) Standards.

(14) Commercial telephones for emergency use are provided in public use areas where available at a reasonable cost.

(15) Adequate security lights are provided at all boat launching ramps when the lights are available at a reasonable cost. In areas where electrical service is not readily available, reflective type signs/markers have been installed and maintained to identify ramp locations.

(16) Information bulletin boards are provided in public use areas containing location charts, emergency numbers, Title 36 Rules and Regulations, safety tips and other information of interest to the visitor.

(17) A hazard analysis inventory is located at the project office. It contains vital information on the chemicals employees may be exposed to while performing their day-to-day duties.

## 12.06 FIRE MANAGEMENT

### a. Scope

The scope of this section is to establish guidelines for the wildland fire management program at Mark Twain Lake.

### b. Policy

Fire is a critical natural process of the ecosystem. Many natural resource values can be enhanced by allowing fire to play its natural role where safe and applicable, providing for the protection of private property and social values. The wildland fire management program at Mark Twain Lake will be consistent with the needs of the public and the management objectives of the

project. Wildland fire management will comply with guidance supplied in ER 1130-2-540, EP 1130-2-540 and the 2001 Federal Wildland Fire Management Policy. The following are the tenets of the fire management activities executed at Mark Twain Lake:

(1) Fire Management and Ecosystem Sustainability – Fire is an essential ecological process and natural change agent. Wildland fires and prescribed fires management policies will be implemented to achieve ecosystem sustainability, including its interrelated ecological and social components.

(2) Protection Priorities – Fire fighter and public safety is the first priority in every fire management activity.

(3) Planning – Fire management plans are developed to define a program to manage wildland and prescribed fires based on the land management objectives.

(4) Science – Fire management will be based on a foundation of sound, current science.

(5) Preparedness – The Mark Twain Lake staff will ensure their capability to provide safe, cost-effective fire management programs in support of land and resource management plans through appropriate planning, staffing, training, equipment, and management oversight.

(6) Suppression – Wildfires will be suppressed or contained immediately and safely, considering fire fighter and public safety, benefits, and values to be protected, consistent with resource objectives.

(7) Prevention – Mark Twain Lake personnel will work with other agencies and affected groups to prevent unauthorized ignition of wildland fires.

(8) Cooperation and Coordination – Fire management planning, preparedness, prevention, suppression, prescribed burn application, and education will be conducted with involvement of cooperating agencies.

### c. Wildfire Management

All wildfires upon project lands shall be suppressed or contained immediately in a manner that provides for the safety of the fire fighter, protection of the public, protection of public facilities, and protection of private property. A fire protection plan that will serve as a guide for the prevention and suppression of wildfires at Mark Twain Lake is contained in the OMP. The objective of the fire protection plan is three-fold: Fire Prevention, Presuppression, and Suppression. These objectives should be based on the following guidelines:

(1) Fire Prevention – To reduce the number of man-caused fires is the primary goal of resource management personnel. Fire problem areas must be determined, and prevention programs must be established to create public awareness of the destruction caused by wildfires.

(2) Pre-suppression – Pre-suppression planning will be aimed at establishing an efficient fire control organization utilizing project personnel and equipment. This fire fighting force will operate in close coordination with similar units provided by local fire protection agencies and personnel from the State of Missouri.

(3) Suppression – Once fires have been started, established procedures are outlined in detail in the OMP. The operations manager will update the fire protection plan annually so that improved techniques learned through training and actual fire fighting experiences can be incorporated.

d. Prescribed Fire Management

Prescribed fire management is used to approximate the natural vegetative disturbance of periodic fire occurrence. This vegetative management tool is used to maintain fire dependent ecosystems and restore ecosystems that are outside their natural balance. It is also used to reduce hazardous fuel loads and for preparation for other management practices. Extensive planning and preparation is necessary to successfully and safely execute prescribed fires. Details of specific prescribed fire management practices are contained in the OMP

e. Cooperating Agencies

Successful wildland fire management is dependent upon cooperation and coordination with local fire protection agencies, affiliated groups, and adjacent landowners. Entering into cooperative agreements or other partnership mechanisms will ensure the safety of the fire fighters and the public during the execution of wildland fire management program.

## SECTION XIII – COST ESTIMATE

### 13.01 INTRODUCTION

#### a. General.

The following tables show general cost estimates for Corps development of proposed new actions and replacement facilities at Mark Twain Lake. The quantities and costs represent a typical Corps guide specification level of design and materials. Costs for Mark Twain State Park facilities were provided by the State.

During actual detailed design of each element, variations in types and quantities of materials, modifications of facilities, inflationary trends, and results from additional engineering tests, will undoubtedly occur. Costs are based on current prices received for similar items of work in the St. Louis District. Price level is 2004.

#### b. Summary of Costs.

Cost estimates for proposed new actions and proposed replacement facilities for Corps and State facilities are listed in the TABLE 13-1.

#### c. Financial Analysis

An efficiency analysis for proposed facilities is presented in TABLE 13-2.

# Mark Twain Lake Master Plan

## TABLE 13-1 Summary of Cost Estimate

GOVERNMENT ESTIMATE WORKSHEET					Sheet 1 of 1
Project:	<b>Mark Twain Lake Master Plan - Conceptual Cost Estimates</b>			DATE: March 2004	
	<b>Proposed New and Replacement Facilities</b>				
	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT	
<b>Ray Behrens Recreation Area</b>					
High Water Boat Ramp	1	each	\$9,000	\$9,000	
Fee Booth w/water and sewer	1	each	\$35,100	\$35,100	
Floating Breakwater by others	1	each	\$750,000	\$750,000	
Sixty-five Site Campground Loop, Infrastructure and Support Facilities	1	each	\$1,187,000	\$1,187,000	
<b>Robert Allen Recreation Area</b>					
Relocate vault toilet	1	each	\$20,000	\$20,000	
Fish Cleaning Station	1	each	\$10,000	\$10,000	
<b>South Fork Recreation Area</b>					
Enlarge parking lot	1	LS	\$40,000	\$40,000	
Relocate vault toilet	1	each	\$20,000	\$20,000	
Fish Cleaning Station	1	each	\$10,000	\$10,000	
<b>Indian Creek Recreation Area</b>					
Unisex Vault/Changing Station	1	each	\$55,000	\$55,000	
Relocate east ramp vault toilet	1	each	\$20,000	\$20,000	
Fishing pier	1	each	\$5,400	\$5,400	
Playground	1	each	\$45,000	\$45,000	
Seventy-five Site Campground Loop, Infrastructure and Support Facilities	1	each	\$1,370,000	\$1,370,000	
<b>Frank Russell Recreation Area</b>					
Replace vault toilets w/waterborne comfort stations	3	each	\$80,000	\$240,000	
Upgrade electric to 50 amp	65	each	\$1,100	\$71,500	
Sewer and water hookups	20	each	\$3,250	\$65,000	
<b>Bluff View Recreation Area</b>					
Fish Cleaning Station	1	each	\$10,000	\$10,000	
<b>SUBTOTAL:</b>				<b>\$3,963,000</b>	
Contingency - 15%				\$594,000	
<b>SUBTOTAL:</b>				<b>\$4,557,000</b>	
Planning, Engineering, & Design - 15%				\$684,000	
Construction Management - 10%				\$456,000	
<b>CORPS TOTAL PROJECT COST</b>				<b>\$5,697,000</b>	
<b>MDNR Proposed Projects</b>					
<b>Mark Twain State Park</b>					
Visitor Contact Station	1	each	\$185,000	\$185,000	
Cabins	6	each	\$7,500	\$45,000	
Fee Booth	1	each	\$35,000	\$35,000	
Campsites	50	each	\$2,500	\$125,000	
Electric Service to Campsites	19	each	\$2,000	\$38,000	
Washhouse	1	each	\$375,000	\$375,000	
Mountain Bike Trail - 10 mi.	1	each	\$30,000	\$30,000	
Hiking Trail - 3 miles	1	each	\$8,000	\$8,000	
<b>Mark Twain State Park - North Extension</b>					
Equestrian Trailhead w/parking	1	each	\$15,000	\$15,000	
Equestrian Campground	1	each	\$25,000	\$25,000	
Equestrian Trailhead <1/4 mile	1	each	\$2,000	\$2,000	
Restroom facilities	1	each	\$125,000	\$125,000	
Fish cleaning station w/parking	1	each	\$30,000	\$30,000	
<b>Subtotal</b>				<b>\$1,038,000</b>	
Contingency 15%				\$156,000	
<b>MDNR TOTAL PROJECT COST</b>				<b>\$1,194,000</b>	

**TABLE 13-2 Efficiency Analysis for New Proposed Items**

<b>Frank Russell Water &amp; Sewer Hookups</b>							
<b>Benefits</b>	Days	Occupancy Rate	Total Days Occupied	Daily Increase in Fee	Annual	Number of Campsites	Total Annual Revenue
Increased fee collection - \$2.00/campsite/hookup	150	0.45	67.5	4	270.00	20	\$5,400.00
Increased fee collection - \$2.00/campsite/hookup	30	0.4	12	4	48.00	20	\$960.00
<b>Total Additional Revenue</b>							\$6,360.00
<b>Costs</b>							
Increased O&M expenses					100.00		
Annualized Construction Cost					5267.32		
<b>Total Costs</b>					5367.32		
<b>Benefit/Cost Ratio</b>					1.18		

<b>Ray Behrens Campground Loop</b>								
<b>Benefits</b>	Days	Occupancy Rate	Total Days Occupied	Daily Increase in Fee	Annual	Number of Campsites	Total Annual Revenue	Initial Cost
Increased fee collection	150	0.5	75	20	1,500	65	97500	
Increased fee collection	30	0.4	12	20	240	65	15600	
<b>Total Additional Revenue</b>							113100	
<b>Costs</b>								
Increased O&M expenses					10,000			
Initial Construction Cost					96,189			\$1,187,000
<b>Total Costs</b>					106,189			
<b>Benefit/Cost Ratio</b>					1.07			
<b>Indian Creek Campground Loop</b>								
<b>Benefits</b>	Days	Occupancy Rate	Total Days Occupied	Daily Increase in Fee	Annual	Number of Campsites	Total Annual Revenue	Initial Cost
Increased fee collection	150	0.5	75	20	1,500	75	112500	
Increased fee collection	30	0.4	12	20	240	75	18000	
<b>Total Additional Revenue</b>							130500	
<b>Costs</b>								
Increased O&M expenses					10,000			
Initial Construction Cost					111,019			\$1,370,000
<b>Total Costs</b>					121,019			
<b>Benefit/Cost Ratio</b>					1.08			

## SECTION XIV - CONCLUSIONS AND RECOMMENDATIONS

### 14.01 CONCLUSIONS

Mark Twain Lake became operational in 1984. Since that time it has become a valued recreational resource for Northeast Missouri. In addition, it has fulfilled its other authorized project purposes including flood control, hydropower generation, fish and wildlife conservation, downstream water quality and dependable water supply.

Management of the park and recreation areas at Mark Twain Lake, as outlined in this plan, will provide quality public facilities. All lake resources will be continually monitored to preserve and maintain these resources at a high level of quality.

### 14.02 RECOMMENDATIONS

It is recommended this updated plan be approved in its entirety to meet operation and management goals and objectives through the year 2014.

## Appendix A

### Mark Twain State Park

#### Mark Twain State Park Capital Improvements Budget Program

TABLE A-1 below shows the current "4-Year Capital Improvements Budget Program" for Mark Twain State Park. The following discussion of the listed projects is based on past conversations or tentative planning efforts.

ID #3124 Develop Public Beach: The existing public beach may be relocated at some point in the future. (This original proposal is likely related to one plan that would have put the marina at the current beach location.)

ID #3099 Design Campground Renovation: Develop plans for upgrading and renovating existing campsites, roads, parking, washhouses, and other existing amenities in campground.

ID #3130 Install. Lighting at Rte. U boat ramp: Install parking lot lights and lights at the public boat ramp. Install electric service to area.

ID #2876 Plan/Design for Public Beach: Planning and design phase for ID #3124, above.

ID #2780 Campground Fee Booth: Construct building for collection of camping fees.

ID #2086 Contact Sta. Displays: Develop, build and install interpretive and other displays at the Visitor Contact. Station to be built at Highway 107 and Rte. U.

ID #2105 Complete Group Camp: Design and construct additional facilities at Camp "Si" Colborn. To include four barracks-style cabins, washhouse, and recreation hall.

ID #2473 Construct Storage Building: Design and construct metal pole barn in service area.

**Mark Twain Lake Master Plan**

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ID #2475 Campground & Showerhouse Renovation: Upgrade and renovate existing campsites, roads, parking, washhouses, and other amenities as defined in ID #3099.

ID #2082 New Showerhouse & 50 Campsites: Design and construct new showerhouse and additional 50 campsites.

**TABLE A-1**

Division of Parks, Recreation and Historic Preservation  
 4 Year Capital Improvements Budget Program  
 4 Year Plans Sorted by Management Unit

Mark Twain		Fiscal Year				
Management Unit: 4110 0650 Reg No. 2		First	Second	Third	Fourth	Future
ID	Rate Project Description	FY 2004	FY 2005	FY 2006	FY 2007	
3124	0 Develop Public Beach	\$0.00	\$0.00	\$0.00	\$0.00	\$348,000.00
3099	0 Design Campground Renovation	\$0.00	\$0.00	\$0.00	\$30,000.00	\$0.00
3130	0 Install Lighting at Rte. U Boat Ramp	\$0.00	\$0.00	\$0.00	\$0.00	\$90,000.00
2876	144 Plan/Design for Public Beach	\$0.00	\$0.00	\$0.00	\$0.00	\$40,000.00
2780	0 Campground Fee Booth	\$0.00	\$0.00	\$0.00	\$0.00	\$36,000.00
2086	51 Contact Station Displays	\$0.00	\$0.00	\$0.00	\$0.00	\$25,000.00
2105	111 Complete Group Camp	\$0.00	\$0.00	\$0.00	\$0.00	\$750,000.00
2473	31 Construct Storage Building	\$0.00	\$0.00	\$0.00	\$25,000.00	\$0.00
2475	107 Campground and Showerhouse Renovation	\$0.00	\$0.00	\$0.00	\$0.00	\$420,000.00
2082	70 New Showerhouse & 50 Campsites	\$0.00	\$0.00	\$0.00	\$0.00	\$650,000.00
		\$0.00	\$0.00	\$0.00	\$55,000.00	\$2,359,000.00

## APPENDIX B

### Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake, Missouri – January 2001

## INTRODUCTION

### I.1 Purpose of Study

The purpose of this study is to update a previous similar study completed in 1988 entitled “*Market Potential and Feasibility Analysis of Commercial Concession Development at Mark Twain Lake, Missouri*” (Horner and Shifrin, Inc.). The primary objectives of the current study include the determination of potential market support for new overnight lodging accommodations, and additional marina capacity either through expansion of existing marinas or the development of an additional new marina at Mark Twain Lake. An additional objective was the selection of three alternative sites for the potential development of a resort hotel or lodge facility at Mark Twain Lake.

### I.2 Methodology

The primary methodology involved in this study included opinion surveys and personal interviews with representatives of concessions, businesses and various organizations in the Mark Twain Lake area. In addition, field site investigations were conducted for the selection and analysis of alternative resort hotel or lodge sites.

Three opinion surveys were conducted which consisted of the following: (1) households representing the general population within a 125-mile radius of Mark Twain Lake (Appendix A); (2) current slip renters at the two marinas at Mark Twain Lake (Appendix B); and (3) owners of pleasure boats within a 100-mile radius of Mark Twain Lake (Appendix C). The general population survey consisted of a telephone survey of 400 randomly selected households within the defined users market area of Mark Twain Lake. The distribution of telephone calls was based on population distribution and reflected the most recent (July, 1999) county population estimates.

The slip renter survey consisted of a mail-out questionnaire to all current slip renters at the Indian Creek Marina and Blackjack Marina at Mark Twain Lake. There were 360 questionnaires mailed of which 213 were completed and returned, for a response rate of almost 60%. The boat owners survey consisted of a mail-out questionnaire in Illinois and a telephone survey in Missouri of randomly selected households with a registered pleasure boat 18 feet or longer in length within the defined users market. Unfortunately, because of the restrictions imposed under the Federal Privacy Protection Act, the desired sample for the boat owner survey was not attained. Detailed results of each survey are located in Appendices A, B and C respectively.

The second major task included personal and telephone interviews with individuals and organizations directly associated with Mark Twain Lake, or located within the Mark Twain Lake immediate area. Individuals and organizations interviewed included the managers/operators of the Indian Creek and Blackjack marinas; the Mark Twain Lake Operations Manager; the Superintendent of the Mark Twain Lake State Park; the Missouri Department of Natural Resources; the Mark Twain Lake Association; motel operators; and local real estate brokers. A summary of these interviews and comments received are contained in Chapter 2 and Appendix E respectively.

## Mark Twain Lake Master Plan

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An additional major task was the selection and analysis of alternative resort lodge or hotel sites adjacent to Mark Twain Lake. This task involved the preliminary identification and screening of twelve sites in respect to the physical and economic feasibility of developing a resort lodge or hotel. A number of site selection criteria were utilized in the site analysis, with three alternative sites being ultimately selected based on a point system established for each site criterion.

### I.3 Summary of Previous Study Recommendations

The previous similar study contained several recommendations regarding the potential for the development of a third marina, and a lodge/hotel resort and restaurant based on an assessment of market demand. Opinion surveys, similar to those included in the present study, were conducted of the general population, boat slip renters and registered boat owners, and formed the primary basis for the conclusions and recommendations.

Recommendations for concessionaire development at Mark Twain Lake in the 1988 study included the following.

- An effective market demand, along with financial feasibility, for justifying the addition of a third marina at Mark Twain Lake or the expansion of the existing two marinas based on the projection of total slip rental demand for 640 slips in the year 2000.
- Market support for an annual demand for 42,200 resort hotel/lodge room nights in the year 2000 based on survey responses. This overnight lodging demand would equate to a 195- room resort hotel/lodge in the year 2000.
- Projected demand for 341,500 meals served in a restaurant associated with a resort hotel or lodge in the year 2000.

### I.4 Summary of Current Study Recommendations

It is concluded in this study that the following actions be pursued to enhance the Mark Twain Lake area and user market. These recommendations are based on an analysis of the Mark Twain Lake environment; surveys of slip renters at Mark Twain Lake, boat owners, and the general population; interviews with local businesses and other organizations; and a market analysis of the existing and potential users market for Mark Twain Lake.

- Development of a quality resort lodge/hotel with a quality restaurant and ancillary uses should be a higher priority than development of a third marina. A resort lodge/hotel should preferably be located near the existing activities, attractions and complementary uses along Highway J above the Dam. The location of a resort lodge/hotel near or in the midst of other activities is preferable considering the potential synergistic effect as a result of mutually supporting activities.
- Development of additional activities (including nighttime), especially those oriented to families and older population.
- Consideration of the development of a third marina only after other amenities (i.e. resort lodge/hotel, etc.) are developed. Considering current slip vacancy rates at the two existing marinas in addition to a general lack of other activities and complementary uses for attracting Lake visitors and users, a third marina could have adverse economic impacts on the existing concessionaires.
- If and when a third marina is developed, it should be centrally located on the Lake, preferably in the Highway 107 area or future expansion area of the Mark Twain State Park to take

advantage of other amenities (i.e. Mark Twain State Park and Shrine) and create a new activity center. An exclusive sailboat marina may be justified.

- Preservation of the quiet, peaceful, relaxing and pristine environment, which is a major attribute of Mark Twain Lake compared to the majority of the competing lakes as cited by survey respondents. While additional commercial activity may be needed, and encouraged, the primary goal should be that of maintaining and preserving the natural attributes which attract the majority of the visitors and users to the Lake.
- Improved fish stocking program through better coordination and management by the entities responsible for management and operation of Mark Twain Lake and Clarence Cannon Dam. Since fishing is a major recreational use of the Lake, it is paramount that the quality of fishing be maintained and enhanced through improved stocking in addition to monitoring and coordination of Lake levels to prevent deterioration of this sport.
- Closer monitoring and coordination of the Lake levels between the responsible entities as it affects recreational boating and fishing.
- Expanded marketing and advertising program for Mark Twain Lake, which implies additional funding from the public and/or private sector. The Lake is not well known, even in Missouri, as evidenced by the survey responses from the general population of which 25 percent stated they had never heard of Mark Twain Lake.
- Improved signage on the major highways advertising Mark Twain Lake, inclusive of all three states within the Lake's market area.
- Evaluation of procedures and practices by law enforcement officials in the immediate area of Mark Twain Lake. Excessive or unnecessary law enforcement was frequently cited by area business people as a factor contributing to a negative image of the Lake and the non-return of some visitors.
- Improving the quality and aesthetic appearance of new development on non-Corps managed properties around the Lake. The majority of the existing commercial development in the immediate area of the Lake is not aesthetically appealing and does not reflect consistent higher quality architectural standards. The respective officials of Monroe County and Ralls County should establish special planning and architectural standards, possibly a special zoning district, towards the goal of enhancing and maintaining consistent higher quality and aesthetically appealing development in the immediate Mark Twain Lake area.

# Master Plan Contacts & Addresses for initial update letter

## Chambers of Commerce

### Hannibal Chamber of Commerce

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Hannibal MO 63401  
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### Mark Twain Lake Area Chamber of Commerce

PO Box 59  
Perry MO 63462  
573.565.2228

### Monroe City Chamber of Commerce

314 South Main Street PO Box 22  
Monroe City MO 63456  
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### Palmyra Chamber of Commerce

Director-Ron Craft  
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### Paris Chamber of Commerce

124 West Caldwell  
Paris MO 65275  
660.327.4450

### Perry Area Chamber of Commerce

Treasurer-Mary Sue Mitchell  
PO Box 105  
Perry MO 63462  
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### Quincy Area Chamber of Commerce

Director-Dwaine Gray  
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Quincy IL 62301-4169  
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poc-Mary

## Clubs/Organizations

### Audubon Society

Executive Director-Roger Still  
Audubon Missouri  
1001 Walnut Street, Suite 200  
Columbia, MO 65201  
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Conservation Officer-David Bedan  
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Poc-Katie

### B.A.S.S.

Mark Twain Chapter  
Local Representative-Greg Wright  
Wright Furniture  
11323 Highway 61  
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poc-Greg Wright

### Conservation Federation of Missouri

Executive Director-Denny Ballard  
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### Ducks Unlimited

Missouri Chapter  
State Chairman- Bill Crowell  
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poc-Troy LaRue

District Representative-Glen Wheeler  
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Poc-Troy LaRue

Marion County Chapter  
Local Representative-Randy Hayden  
613 Shaffer Drive  
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Poc-Troy LaRue

### Historical Society

Monroe County Historical Society  
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101 North Main Street  
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# Master Plan Contacts & Addresses for initial update letter

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Perry MO 63462  
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## **Missouri Equine Council**

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## **National Wild Turkey Federation**

Regional Director-Travis Scott  
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Centralia MO  
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Local Representative-Travis Moore  
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Hannibal MO 63401

Local Representative-Bruce Mills  
14114 Monroe Road 611  
Paris MO 65275

Local Representative-Chris Coe  
Salt River Sharp Spurs

## **North Fork Watershed Initiative**

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34146 Route U  
Stoutsville MO 65283  
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## **Quail Unlimited**

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382 Northwest Highway 18  
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poc-Jeff Hodges

Local Representative-Charlie Wright  
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Local Representative-Larry Timpe  
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## **Sierra Club**

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## **The Nature Conservancy**

State Representative-Wanda Lovan  
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## **Tri City Commission**

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## **Whitetails Unlimited**

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Monroe City Chapter  
Local representative-Jeff Botkins  
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Hannibal Chapter  
Local representative-Gene Wade  
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Hannibal MO 63401

## **County Commissions**

### **Monroe County**

Presiding Commissioner-David Utterback  
East Commissioner-Mike Whealan  
West Commissioner-Glen Turner  
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# Master Plan Contacts & Addresses for initial update letter

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West Commissioner-Jesse Poage  
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## **Government Agencies**

### **Hannibal Visitors Bureau**

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### **Missouri Department of Conservation**

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Chairman-Don Griffon  
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### **Missouri Department of Natural Resources**

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Mark Twain State Park  
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Missouri Dept. of Natural Resources  
Chief, Planning Section  
Water Pollution Control Program  
Division of Environmental Quality  
P.O. Box 176  
Jefferson City, Missouri 65102

### **Missouri Department of Transportation**

Mr. Kirk Juranus, District Engineer  
Missouri Dept. of Transportation  
P.O. Box 1067  
Hannibal, Missouri 63401

### **Missouri Water Patrol**

CPT. Dale G. Sluhan  
District V Supervisor  
Missouri Water Patrol  
P.O. Box 1368  
Jefferson City, Missouri 65102

### **Missouri Department of Tourism**

Local Office-Bob Greenely  
PO Box 575  
Hannibal MO 63401  
573.248.2420

### **Natural Resource Conservation Service**

Resource Conservationist-Andrea King  
Paris Service Center  
18771 Highway 15  
Paris, Mo 65275-9597  
660.327.4137  
poc-James Cryer

Resource Conservationist-Gary Noel  
New London Service Center  
17623 Highway 19 Suite 3  
New London, MO 63459-4800  
573.985.8611

### **United States Fish & Wildlife Service**

Richard Steinbach  
1704 North 24<sup>th</sup> Street  
Quincy IL 62301  
217.224.8580  
poc-Donna

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## Master Plan Contacts & Addresses for initial update letter

### United States Forest Service

Henry Hickerson  
PO Box 988  
Poplar Bluff MO 63902  
573.785.1475  
poc-Carolyn

### University Extension Offices

Regional Office  
Dr. Soneeta Grogan  
400 South Main Street  
Palmyra MO 63461  
573.769.2071

### Marion County

Dave Hill  
University Extension Office  
Courthouse  
Palmyra MO 63461  
573.769.2177

### Monroe County

John Wheeler  
208 North Main Street  
Paris MO 65275  
660.327.4185

### Ralls County

Jim Meyer  
PO Box 540  
New London MO 63459  
573.985.3911

### Marinas

#### Indian Creek Marina

Mr. Larry Spalding  
Indian Creek Marina  
PO Box 157  
Monroe City MO 63456  
573.735.4075

#### Blackjack Marina

Mr. John Gilmore  
Blackjack Marina, Inc.  
PO Box 310  
Perry MO 63462  
573.565.2233

### TOWNS

#### Center

Mayor-Clyde Ardry  
103 South Public PO Box 147  
Center MO 63436  
573.267.3331  
poc-Marsha

#### Hannibal

Mayor-Roy Hark  
320 Broadway  
Hannibal MO 63401  
573.221.0111

poc-

#### Mexico

Mayor-Dan Parrott  
300 North Coal Street  
Mexico MO 65265  
573.581.2100  
poc-

#### Moberly

Mayor-Lawrence Rucker  
101 West Reed  
Moberly MO 65270  
660.263.4420  
poc-Paulette

#### Monroe City

Mayor-Betty L. Barnes  
PO Box 67  
Monroe City MO 63456  
573.735.4585  
poc-Jackie

#### New London

Mayor-Les Schrader  
PO Box 425  
New London MO 63459  
573.985.4041

#### Palmyra

Mayor-Jim Browning  
PO Box 32  
Palmyra MO 63461  
573.769.2223  
poc-Ruth

#### Paris

Mayor-Russell Peterson  
124 West Caldwell  
Paris MO 65275  
660.327.4334  
poc-Robbie

## Master Plan Contacts & Addresses for initial update letter

### **Perry**

Mayor-Jim Talbott  
PO Box 280  
Perry MO 63462  
573.565.3131  
poc-Linda

### **Quincy**

Mayor-Charles W. Sholz  
730 Maine Street  
Quincy IL 62301  
217.228.4545  
poc-Johnna

### **Shelbina**

Mayor-Robert Greening  
116 East Walnut Street  
Shelbina MO 63468  
573.588.4104  
poc-Beth

### **Vandalia**

Mayor-Raymond Barnes  
200 East Park  
Vandalia MO 63382  
573.594.6186  
poc-Denise

### **Water Districts**

#### **Cannon Water District #2**

Rhonda Elliot  
PO Box 430  
Perry MO 63462  
573.565.2656

#### **Clarence Cannon Wholesale Water Commission**

Liz Grove  
34146 Route U  
Stoutsville MO 65283  
573.672.3221

#### **Monroe County Water District #2**

Director-Nancy Riechmann  
Monroe County Water District #2  
23504 Highway 24  
Paris MO 65275  
660.327.4778

### **Elected Officials**

Honorable Christopher S. Bond  
United States Senator  
7700 Bonhomme Road  
Suite 615  
St. Louis, Missouri 63105

Honorable Jean Carnahan  
United States Senator  
Thomas F. Eagleton Federal Courthouse  
Suite 23-356  
111 South Tenth Street  
St. Louis, Missouri 63102

Honorable Kenny Hulshof  
Representative in Congress  
201 North 3rd St., Suite 240  
Hannibal, Missouri 63401

Honorable John Cauthorn  
Missouri Senator  
23712 Audrain Road, 364  
Mexico, Missouri 65265

Honorable Wes Shoemyer  
Missouri Representative  
16350 Monroe Road, 184  
Clarence, Missouri 63437

**Public Meeting Contacts – December 5, 2001**

Mr. Charlie Davidson  
Conservation Foundation  
3303 Pershing  
Hannibal, MO 63401

Mrs. Noraleen Davidson  
3303 Pershing  
Hannibal, MO 63401

Ms. Lana Woody  
Missouri Department of Natural Resources  
Mark Twain State Park  
Florida, MO 65283

Ms. Marian Goodding  
MDNR - Brookfield  
Brookfield  
Brookfield, MO

Park Superintendant Charles Hesse  
MDNR - Mark Twain State Park  
20057 State Park Office Road  
Stoutsville, MO 65283

Mr. Dick Deerfield  
808 Lawn Street  
Monroe City, MO 63456-9359

Mr. Larry Spalding  
Indian Creek Marina  
419 N. Vine  
Monroe City, MO 63456-9359

Mr. Robert Smith  
RR P.O. Box 124  
Monroe City, MO 63456-9359

Mr. Jerry Dowell  
State Senator Cauthorn's Office  
State Capital Rm 427  
Jefferson City, MO 65101-

Mr. Tom Baltrusaitia  
1412 36th Street  
Hannibal, MO 63401

Mr. Marvin Rayl  
17029 Madden  
Monroe City, MO 63456-9359

Mrs. Pat Rayl  
17029 Madden  
Monroe City, MO 63456-9359

Mr. Scott Callicott  
U.S. Rep. Hulshof's Office  
201 North 3rd Street  
Hannibal, MO 63401

Mr. Ross Dames  
Missouri Department of Conservation  
653 Clinic Road  
Hannibal, MO 63401

**Public Meeting Contacts – December 5, 2001**

Ms. Elizabeth Grove  
34146 Rt. U  
Stoutsville, MO 65283

Mr. And Mrs. Ivan Wharton  
The Landing  
42819 Landing Lane  
Monroe City, MO 63456

Ms. Andrea King  
USDA - NRCS  
18771 Highway 15  
Paris, MO 65275

Mr. Terry Hill  
USDA - NRCS  
4619 South Clark  
Mexico, MO 65265

Mr. Jim Talbott  
City of Perry  
P.O. Box 122  
Perry, MO 63462

Ms. Doris Scheiner  
Rustic Oak Restaurant  
22448 Highway J  
Perry, MO 63462

Mr. Bill Scheiner  
Rustic Oak Restaurant  
22448 Highway J  
Perry, MO 63462

Mr. Charles Naugle  
26555 Monroe Road  
Monroe City, MO 63456

Mr. E. J. Franklin  
Mark Twain Lake Chamber of Commerce  
P.O. Box 1508  
Hannibal, MO 63401

Mr. Mark Fuqua  
Mark Twain Regional Council of Government  
42494  
Perry, MO 63462

Mr. Kevin Fuller  
Missouri Dept. of Transportation  
20912 Monroe Road 475  
Stoutsville, MO 65283

Mr. David Bleigh  
3365 Palmyra Road  
Hannibal, MO 63401

Mr. Bob Greenley  
726 Clinic Road  
Hannibal, MO 63401

Mr. James R. Behrens  
Ralls Co. State Bank  
245 Rolling Meadows  
Hannibal, MO 63401

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**Public Meeting Contacts – December 5, 2001**

Mr. Ron Howard  
Ralls County  
127 E. Main St.  
Perry, MO 63462

Mr. Steve Peterson  
Missouri State Water Patrol  
P.O. Box 116  
Perry, MO 63462

Mr. Travis Moore  
NWTF - National Wild Turkey Federation  
1840 CR 319  
Palmyra, MO 63461

Mr. Jim Burns  
Box 1271  
Hannibal, MO 63401

Senator John Cauthorn  
Missouri State Senate  
23712 And 364  
Mexico, MO 65265

Ms. Angie Quinley  
KHQA Television  
301 S. 36th St.  
Quincy, IL

Planning, Programs and Project Management Division  
Planning and Project Development Branch

Policy Coordination Section Chief  
Missouri Department of Conservation  
P.O. Box 180  
Jefferson City, Missouri 65102-0180

**Typical Letter Sent  
to Agency Offices**

Dear Sir:

The St. Louis District, U.S. Army Corps of Engineers, is preparing an update of the Mark Twain Lake Master Plan. Mark Twain Lake is located in portions of Ralls and Monroe counties. A section of the Master Plan describes the presence or possible presence of Federal and state threatened and endangered species in the project area.

Please provide a list of state threatened and endangered species and species of conservation concern that occur in these counties to U.S. Army Corps of Engineers, St. Louis District, 1222 Spruce Street, ATTN: Mr. Francis Walton (CEMVS-PM-F), St. Louis, Missouri 63103-2833, or by fax at (314) 331-8806. Information may be site specific, county-wide or a combination thereof. I have enclosed a map of the project area and our draft list. Feel free to enter any information directly on the map or make changes to the text if it is convenient and/or appropriate.

Contact Mr. Francis Walton at (314) 331-8487 if you have any questions or the need for additional information.

Sincerely,

David E. Leake  
Chief, Planning and Project  
Development Branch

Enclosures

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JAN 25 2002

Planning, Programs and Project Management Division  
Planning and Project Development Branch

Mr. Larry Spalding  
Indian Creek Marina  
PO Box 157  
Monroe City, Missouri 63456

**Typical Letter Sent  
to Marinas**

Dear Sir:

As you know, the U.S. Army Corps of Engineers, St. Louis District, has begun the process of updating the Mark Twain Lake Master Plan. A draft of the master plan is scheduled for completion in the summer of 2002. In order to prepare this draft, please submit a description of any development anticipated within the next ten years if not included in the currently approved development plan on file in the St. Louis District, Real Estate Management and Disposal Office (enclosed). I have included a copy of your current development plan currently on file for your reference.

Please consider for inclusion in your plan any anticipated expansion of facilities such as wet slips, dry docks, storage areas, parking, and harbor area. Also, consider provision of lodging, covered slips, repair and guide services, boat rental and any anticipated changes in customer market, i.e., emphasis on powerboats, rentals etc.

I would appreciate your proposed plans by March 8, 2002. As a partner in lake operation, your input is critical if we are to develop the best overall plan for the lake.

If you have any questions, please contact my Outdoor Recreation Planner, Mr. Francis J. Walton, at 314-331-8487.

Sincerely

Signed by  
**DAVID LEAKE**

David E. Leake  
Chief, Planning and Project  
Development Branch

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PM-F  
Winston *pd*  
RE-M

Leake  
PM

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NOV 20 2001

Planning, Programs and Project Management Division  
Project Management Branch for Flood Control and Support for Others

Honorable Christopher S. Bond  
United States Senator  
7700 Bonhomme Road  
Suite 615  
St. Louis, Missouri 63105

**Typical Letter Sent  
to Elected Officials**

Dear Senator Bond:

The St. Louis District, U.S. Army Corps of Engineers is initiating the reevaluation and update of the Mark Twain Lake Master Plan. The Master Plan is the primary document governing the use, development, management, and administration of all natural and man-made resources at Mark Twain Lake and has been supplemented seven times since the last update. These supplements have resulted in authorized changes in project facilities and area uses. An updated plan will reflect these changes and serve to guide project development during the next ten years. The intent of this letter is to inform you of the process we will employ for updating the plan.

The master planning effort will be coordinated with elected officials, governmental agencies, the general public, and special interest organizations. A public information-gathering workshop is scheduled for December 5, 2001 from 7:00-9:30 P.M. at the M. W. Boudreaux Visitor Center at Mark Twain Lake. By summer 2002, a draft master plan will be formulated and presented at a public workshop. The final draft plan will be prepared and submitted for review to government agencies and the general public in the fall of 2002. Your office will be notified when these events are scheduled. News releases will communicate progress on the update to the public.

We will continue to keep you informed as we proceed with this effort. If you desire additional information, please contact my Executive Assistant, Ms. Julie Ziino, at (314) 331-8016.

Sincerely,  
signed  
Michael R. Morrow  
Colonel, U.S. Army  
District Engineer

Michael R. Morrow  
Colonel, U.S. Army  
District Engineer

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NOV 20 2001

Planning, Programs and Project Management Division  
Project Management Branch for Flood Control and Support for Others

Mr. Jerry Conley, Director  
Missouri Department of Conservation  
P.O. Box 180  
Jefferson City, Missouri 65102

**Typical Letter Sent  
to Agency Directors**

Dear Mr. Conley:

The St. Louis District, U.S. Army Corps of Engineers is initiating the reevaluation and update of the Mark Twain Lake Master Plan. The Master Plan is the primary document governing the use, development, management, and administration of all natural and man-made resources at Mark Twain Lake and has been supplemented seven times since the last update. These supplements have resulted in authorized changes in project facilities and area uses. An updated plan will reflect these changes and serve to guide project development during the next ten years. The intent of this letter is to inform you of the process we will employ for updating the plan.

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We will continue to keep you informed as we proceed with this effort. If you desire additional information, please contact my Executive Assistant, Ms. Julie Ziino, at (314) 331-8016.

Sincerely,  
Michael R. Morrow  
Colonel, U.S. Army  
District Engineer

Michael R. Morrow  
Colonel, U.S. Army  
District Engineer

*FW 11/15*  
Walton  
PM-F  
*Leake*  
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Bigeon  
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## APPENDIX C

### PUBLIC INVOLVEMENT PLAN FOR MASTER PLAN UPDATE

Coordinating the update of this Master Plan with the public and government agencies was very important for identifying resources and determining public needs and desires. Through an informal workshop, letters, meetings and news releases, the public and agency partners have been involved and informed during the entire update process. Notification of congressional interests was an important part of the public coordination and public involvement process as well. Elected officials, organizations and the public were invited to participate in the workshops and review the draft and final draft plans.

Part I includes comments that were received relative to the public meeting held in December 2001 and from the campers and other lake users the following summer. The project staff has provided responses to comments when appropriate. Part II includes comments and responses received from organizations and individuals regarding the final draft released in October 2003.

The Master Plan contact list and correspondence related to the update follow Part II of the comments section.

### Part I: PUBLIC MEETING – INITIAL PUBLIC COMMENTS RECEIVED ON 5 DECEMBER, 2001

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From: Not Given

Address:

- 
1. There should be more recreational and private development of the shoreline at Mark Twain Lake. Individual is interested in being an active participant in development and investment.

**Response: The Corps of Engineers continue to improve recreational opportunities within applicable authorities and available funding. A recent market feasibility study reinforced the need for additional marina/lodging facilities. The Corps welcomes the opportunity to improve commercial recreational development at the lake through private investment.**

It is the policy of the Chief of Engineers to protect and manage shorelines of all civil works water resource development projects under Corps jurisdiction in a manner which will promote the safe and healthful use of these shorelines by the public while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions will be to achieve a balance between permitted private uses and resource protection for general public use.

As in the case of Mark Twain Lake, private shoreline uses (i.e. cabins, boat docks) are not allowed on water resource projects where construction was initiated after December 13, 1974, or on water resource projects where no private shoreline uses existed as of that date.

Ownership of private land does not convey any exclusive rights to the use of the adjoining public lands. This policy is designed to eliminate the development of new private facilities on public lands, and grandfather those already in existence. This is done to ensure public use of public lands and shorelines. Reserving Federal lands for private exclusive use is contrary to the intent of the Congress who appropriated public funds for this facility.

2. There should not be any development along the shoreline of Mark Twain Lake. Individuals like the current shoreline development policy.

**Response: The current shoreline development policy prohibits shoreline development. However, commercial development opportunities and locations have been identified.**

3. The development of the underwater fish structures in coves is great. Would like to see continued development of these structures.

**Response: Development of fish habitat will continue in partnership with the Missouri Department of Conservation and local organizations. Corps of Engineers involvement is subject of funding availability.**

4. The Corps needs to develop a trap range to shoot clay birds.

**Response: The development of a trap range is subject to approval by higher authorities and the availability of a location that meets safety requirements and a viable challenge cost-share partner.**

5. I am opposed to the addition of campsites on the Corps or State Park lands.

**Response: Comment noted.**

6. The Government should allow the existing marinas to sublease parts of their areas for lodging.

**Response: Current commercial leases with Blackjack and Indian Creek marinas allow for subleases subject to approval of a proposal and management plan.**

7. Interested in developing a parcel of Corps land adjacent to the east side of the John Spalding Beach. The development would include cabins, ancillary docking and trails into the Spalding Recreation Area.

**Response: This area has not been identified for commercial development. Future commercial development of this area would be subject to a proposal, feasibility analysis and determination of availability.**

8. The Government should open 25 miles of the shoreline with good lake view for private development. The land should remain in Government ownership and long term leased to individuals for the purpose of residential development.

**Response: It is the policy of the Chief of Engineers to protect and manage shorelines of all civil works water resource development projects under Corps jurisdiction in a manner which will promote the safe and healthful use of these shorelines by the public while maintaining environmental safeguards to ensure a quality resource for use by the public. The objectives of all management actions will be to achieve a balance between permitted private uses and resource protection for general public use.**

**Private shoreline uses are not allowed on water resource projects where construction was initiated after December 13, 1974, or on water resource projects where no private shoreline uses existed as of that date.**

**Ownership of private land does not convey any exclusive rights to the use of the adjoining public lands. This policy is designed to eliminate the development of new private facilities on public lands, and grandfather those already in existence. This is done to ensure public use of public lands and shorelines. Reserving Federal lands for private exclusive use is contrary to the intent of the Congress who appropriated public funds for this facility.**

9. The owner of The Landing is interested in building a water plant on Government land or installing an intake into the lake for the purpose of supplying water to The Landing. The location is adjacent to the east side of the John Spalding Beach.

**Response: Comment noted. The water supply of Mark Twain Lake is subject to contractual agreement between the State of Missouri,**

**Corps of Engineers and Clarence Cannon Wholesale Water Commission. Deviations would require negotiations of all entities.**

10. I am opposed to any continued development of the Mark Twain Lake Project with the exception of day use or low intensive recreation use.  
**Response: Comment noted.**
11. The project needs more/better quail habitat. Fescue should be eradicated.  
**Response: The environmental stewardship responsibilities of the Corps of Engineers include habitat analysis by professional resource managers. These analysis are incorporated into management prescriptions for long term objectives of public lands. Overall management goals are to maintain optimum habitat conditions for a diversity of species.**
12. The project needs a place designed to shoot clay birds. Development of a trap range would compliment the area and it's users.  
**Response: See comment #4 above.**
13. The Mark Twain State Park is starting a land management plan with resource objectives. They would like to coordinate their management plan with the Corps OMP.  
**Response: Comment noted.**
14. The Corps needs to continue what it does best, manage quality recreation facilities and protect the shoreline.  
**Response: Comment noted.**
15. Private industry needs to work on providing activities in the area for families to do when they are not on the lake.  
**Response: Comment noted.**
16. Missouri Department of Conservation strongly opposes any private residential development of the public land or shoreline.  
**Response: Comment noted.**
17. Efforts should be devoted to obtain commercial lodging opportunities on the lake.  
**Response: A recent market feasibility study reinforced the need for additional marina/lodging facilities. The Corps of Engineers welcomes the opportunity to improve commercial recreational development at the lake through private investment.**
18. Additional marina facilities are necessary to accommodate more visitors.  
**Response: See comment #17 above.**

19. The Corps should devote more effort to improving public fishing accesses.

**Response: There are no additional boat ramps planned for construction on Mark Twain Lake at this time. Access to the shoreline is difficult due to pool fluctuations, topography and high maintenance requirements. Future development of fishing access for disabled individuals has been approved and is subject to available funding.**

20. Full service hookups are needed in Corps Campgrounds.

**Response: Limited full service hookups for existing campsites have been approved and are under construction in the Ray Behrens and Indian Creek Campgrounds where environmentally and economically feasible.**

21. The Corps should continue to market the lake in all available markets.

**Response: The Corps continues to partner with local entities to encourage tourism through attendance at boat/sports shows, web pages, brochures, news releases, and special events.**

From: Indian Creek Marina  
Address: P.O. Box 57, Monroe City, Missouri 63456

# INDIAN CREEK

DEVELOPMENT CORPORATION



January 5, 2002

Department of the Army  
St. Louis District, Corps of Engineers  
Mark Twain Lake Project Office  
20642 Highway J  
Monroe City, Missouri 63456-9359

LAWRENCE J. SPALDING  
President  
419 N. Vine St.  
Monroe City, Missouri 63456  
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HAROLD SPALDING  
Vice-President  
P.O. Box 54  
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ALBERT SPALDING  
Secretary/Treasurer  
48 Ruth Circle  
Monroe City, Missouri 63456  
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JOHN H. MARTIN  
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GEORGE BROUGHTON  
Director  
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Ender, Missouri 63439  
(573) 439-5210

CHRISTIAN LEHENBAUER  
Director  
Rural Route 2  
Monroe City, Missouri 63456  
(573) 725-2936

INDIAN CREEK MARINA  
on Mark Twain Lake  
P.O. Box 157  
Monroe City, Missouri 63456  
(573) 735-4079

Gentlemen:

In response to your letter of November 21, 2001, regarding development of the Mark Twain Lake Master Plan establishing project goals and objectives for the next ten year period, we and our advisors respectively submit the following recommendations and proposals for your consideration.

To facilitate the enhancement of Lake Area development, it is our hope that these recommendations can be incorporated in the early years of your plan.

There has never been a more opportune time for the enhancement of Mark Twain Lake for recreational and commercial purposes.

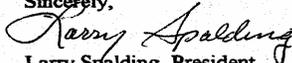
Lack of expanded recreational facilities has contributed to the closing of many businesses around the lake over the past two to three years contributing to an already depressed economic situation.

However, with the Mark Twain Lake area becoming a crossroads of the Avenue of The Saints and the Chicago to Kansas City Expressway plus the recreational requirements of more and more retirees from the St. Louis region who are moving into this area, it is time to take the lake to the next level.

By expanding recreational facilities and business opportunities, the Corps has the opportunity to make a significant contribution to an economically depressed area.

We appreciate the opportunity to have input into to your plan and trust that serious consideration will be given the attached recommendations.

Sincerely,



Larry Spalding, President  
Indian Creek Development Corporation  
DBA, Indian Creek Marina

CC  
U.S. Senator Christopher "Kit" Bond  
U.S. Senator Jean Carnahan  
U.S. Congressman Kenny Hulshof  
Governor Bob Holden  
Lt. Governor Joe Maxwell

Senator John Cauthorn  
Representative Wes Shoemaker  
Representative Sam Berkowitz  
Representative Robert Clayton

P.O. BOX 157 • MONROE CITY, MISSOURI 63456

Recommendations:

22. We recommend that the Corp of Engineers:

A. Provide a written contract that grants the renewal of leases for a period commensurate with the type of development and length of mortgage amortization in order that developer can obtain financing through commercial sources.

**Response: Long term leases are subject to Federal laws and regulations of the Department of the Army for the management of real property for commercial concessions. Deviations can be negotiated on a case by case basis subject to a written proposal, adequate financial resources and a viable management plan.**

B. Change its policy to enable the granting of longer-term commercial leases.

**Response: See Comment A above.**

C. Assist in the development of utilities and other infrastructure, in designated areas, necessary to best utilize public property for lodging and other concession purposes.

**Response: The Corps of Engineers supported development of non-revenue producing infrastructure at existing marinas. New additional development would be subject to private sector interest in commercial concessions and the availability of supplemental appropriations.**

D. Divestment of designated areas around Lake that have potential for economic development by private ownership outside the 300 ft. green strip.

**Response: All lands in public ownership meet the requirements of authorized project purposes.**

E. That all Corp of Engineer studies, surveys, visitation records and itemized expenditures, by sub categories (i.e. fish restocking, equestrian trail, rodeo, Lake Promotion, etc.) be made available to the public via the Internet.

**Response: Substantial improvements are being made to provide public information on the internet.**

F. That the Corps of Engineers revise its policy on the sale of electrical power produced at the dam generation plant to ensure that the production of electricity would not take precedence over the need to maintain a lake level that is necessary and beneficial to fish spawning and other recreational endeavors.

**Response: Power generation is governed by contractual agreements.**

**Actual generation periods and volumes of water is subject to water control policies and manuals developed by the Corps of Engineers. The water control manual balances the need of hydropower generation, flood control, water supply, environmental stewardship, downstream interests and recreation. Power generation has been and will continue to be stabilized during critical spawning periods thru cooperation by the Corps of Engineers, Missouri Department of Conservation, Southwest Power Administration and the power industry.**

G. To form an Advisory Committee as outlined in Page 2 of these recommendations.

**Response: Comment noted. The Corps of Engineers welcomes the opportunity to partner with outside interests and has a working relationship with local communities, chambers of commerce and municipal governments.**

H. Formulate a new Mission Statement that says part of the goal of the Corps of Engineers is to develop recreational aspects of the lake.

**Response: Recreation is one of the authorized purposes for Mark Twain Lake. Large investments of public tax dollars thru authorities and appropriations have been invested in the development of public recreation facilities at Mark Twain Lake and all Corps of Engineer projects nationwide.**

23. Advisory Committee:

We recommend the establishment of a local advisory committee.

The purpose of the committee would be to work with and make recommendations for the overall development of the lake to the Corps of Engineers.

The committee would consist of ten members. Each of the two United States Senators would appoint one member and one member would be appointed by the United States Representative. The other seven members would be elected by popular vote of the public from nominees representing Ralls, Monroe, Marion, Shelby, Audrain and Randolph counties.

Local, state, and nationally recognized service clubs and the county commissions would make nominations for committee members.

The seven Advisory Committee members would be elected by popular vote of the public at an annual meeting.

By-laws would be established by the elected Advisory Committee members.

Overall recommendations would include but would not be limited to the following:

- A. Budgeting aspects of the lake.
- B. Future development of the Lake for economical expansion.
- C. Have input in the generation of electrical power to maintain optimum lake levels, which are critical to recreation and fish spawn.
- D. Review statutory restrictions made on Corps of Engineers on lakes built after 1972 and make recommendations for amendments favorable to development of said lakes.
- E. Commit to lobbying efforts to get above amendments introduced and passed.
- F. Make a yearly evaluation of committee goals.
- G. Monitor accountability of Corps of Engineers for adherence to established goals set by Advisory Committee.

**Response: Comment noted.**

NAME: Charlie Davidson  
ADDRESS: 3303 Pershing, Hannibal, MO 63401

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24. "Having fished and hunted, primarily quail and woodcock (some years) in fields adjacent to Salt River for the last 60 years, I find the area from Norton Bridge up past Shaffer property up to about 5 years ago was once wonderful rabbit and quail habitat. Areas that were the best have now reverted to fescue so heavy and thick you can't walk in it."

"My question is this: Has any consideration been given to returning these areas to small game consideration-similar to those plans being developed by the Missouri Department of Conservation?"

"Even strips of bare ground for dusting and a few strips of prairie grasses and a food plot or two would be a lot. Just an old quail hunter (88) but would like to see my grandkids enjoy some of the times I have had."

**Response: See Comment #11 above.**

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NAME: Q.U. (Quail Unlimited)  
ADDRESS:

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25. "Consideration should be given to control of exotic invasive species, particularly serectia lespedeza and tall fescue.

Also, it is important to maintain early successional vegetation. Aggressive measures should be taken to maintain old fields in native vegetation through mechanical, chemical and prescribed fire methods.

Every effort should be made to allow public access to as many acres as possible for the purposes of hunting and other consumptive sports."

**Response: Current management plans include various habitat manipulation techniques to promote vegetative diversity. An aggressive prescribed burn plan has been part of this for over 10 years.**

**Public access is permitted on all lands and waters of the Mark Twain Lake Project except designated administrative and operational areas. Hunting is also permitted project wide except for within recreation areas and other areas signed as such for safety purposes.**

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NAME: Barbara Pickering

ADDRESS: City of Mexico, 300 N. Coal. Mexico, Missouri 65265

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26. Having been involved with Mark Twain Lake since it's inception and now a resident houseboat owner at Black Jack Marina, I appreciate the opportunity to share with you some suggestions for the Master Plan Update.

Along with many others, we had hoped for more of an economic impact on the communities surrounding MTL. I feel that because development is not allowed within 300 feet of the Lake that it has kept many businesses from being able to survive. At one time, I was pretty sure that you were going to allow businesses to have docks on the water but that has never happened.

**Response: The Corps welcomes commercial development at Mark Twain Lake and believes the key to future benefits include addressing the need for lodging and/or resort development.**

**Community docks must comply with Corps of Engineer standards and be available to the general public. Both marinas were willing to meet the needs of local businesses so long as the additional docks were provided at the expense of the local businesses.**

27. Another service lacking, I feel, are docks for nightly, weekly, monthly rental for fishermen. Therefore, if they come for several days or a week they have to pull their boats out every day. This is inconvenient for them and the rental docks could be very helpful in bringing money in to be used in other developments. Another thought would be fishing boat rentals but that would also have to be located on the water.

**Response: Boat rentals and docks are available at both marinas.**

28. As you know, there were a group of local businessmen interested in building a third marina, cabins, restaurant and landing strip. Because they refused to build it at the site selected by DNR (which they deemed to be the worst site on the Lake and years later DNR finally agreed) they were not able to proceed with the project. That would have certainly helped the Lake to grow.

**Response: Comment noted.**

29. MTL is a beautiful lake. It should be promoted to the entire State of Missouri as well as surrounding states. I serve on the Missouri Highway Corridor Commission as a co-chairman of the Link the Lakes Corridor. We work with other communities along Highway 54 to promote a tourism corridor from Hannibal and Mark Twain Lake to Branson and Table Rock Lake. It would allow families to experience all kinds of entertainment clear across the State of Missouri.

**Response: Improvements to the transportation corridors in northeast Missouri will provide benefits for tourism to the area.**

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From: Travis Moore, Northeast Missouri Chapter of the NWTF  
Address: 1840 CR 319, Palmyra, MO 63461

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30. My other hope is that the Corps be more flexible in working with private conservation groups. I have a specific example. Last year, our NWTF chapter wanted to host a women's only dove hunt. We offered to plant and maintain a sunflower field and asked if it would be possible to do that on Corps ground and keep the field closed for two days before opening it to the public. (The season opened on a Friday, we wanted to hold the event on Saturday,) I thought it was a win/win situation for both the Corps and the NWTF. We could hold our hold our event and the Corps would gain a dove field for public use at no cost, and the number of "limited resource" users using the area would go up. Unfortunately, the Corps response was "If we did it for you, we'd have to do it for everyone". This really rubs me the wrong way because our NWTF chapter had planted food plots for free in the past, we've planted trees on Corps ground, and we have worked to scout and identify the best blinds sites for the handicap turkey hunt. I would just like to see more flexibility. The situation could have been beneficial for both of us.

**Response: Food plots are currently planted on public lands by private conservation groups and individuals through challenge cost share agreements and the volunteer program. It is difficult to exclude public use and access to public lands for special groups. The Corps of Engineers provide dove hunting opportunities to the public on various areas. In addition, these areas are available for use by all members of the public. The Corps partners with various private conservation groups to provide hunting and other recreational opportunities at Mark Twain Lake. This activity needs to be submitted as a formal partnership proposal and discussed with Corps management to determine if the concept can be refined to address items of concern.**

## Part II: FINAL DRAFT COMMENTS

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From: Missouri Department of Natural Resources  
Address: Jefferson City, MO

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31. Cabin development is included in our long-range development plan; however, no “resort” development is proposed for Mark Twain Lake State Park as suggested on Plate 7. Expansion of Camp Colborn group camp is a possible future project.

**Response: The Master Plan was revised to reflect State comments.**

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From: Jeff Hodges – Quail Unlimited  
Address: 382 NW HWY 18, Clinton, Missouri

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32. Endorse and adopt management recommendations of the Northern Bobwhite Conservation Initiative.

Adopt invasive exotic species control program, particularly control of Serecia lespedeza, Crown vetch, and tall fescue.

Continue and expand the use of prescribed fire as a management tool.

Adopt more aggressive openland and savannah management as these were two key ecosystems of the area.

Adopt more aggressive early succession management to maintain and establish openlands and savannahs.

Quail Unlimited is interested in partnering in the development of an openland and early succession management plan.

**Response: The environmental stewardship responsibilities of the Corps of Engineers include habitat analysis by professional resource managers. These analyses are incorporated into management prescriptions for long term objectives of public lands. Overall management goals are to maintain optimum habitat conditions for a diversity of species. Current management plans include various habitat manipulation techniques to promote vegetative diversity. An aggressive prescribed burn plan has been part of this for over 10 years.**

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From: Bob Riley, Area Chairman, Quail Unlimited  
Address: P.O. Box 7008, Holiday, MO

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33. We believe that a marina for the west end of the lake should be included in the Master Plan. It is unacceptable for the citizens of the Paris Area and further west not to have a marina. It is our understanding that all slots are rented at the other marinas. This along with greater economic impact for west

side if marina was built, should be all the more reason for serious consideration of building one.

**Response: Potential marina sites on the west end of the lake have been identified in the master plan. A recent market feasibility study stated the need for additional lodging/marina facilities. The Corps of Engineers welcomes the opportunity to improve commercial recreational development at the lake through private investment. See Appendix B, section I.4.**

Being hunters, we want to suggest that you rent, lease or whatever, the Corps crop acres to local farmers and require them to leave the Corps portion of crop (25-33 percent) in the field for wildlife. This would (no cost to Corps) provide feed for wildlife, keep the acres from growing up and being totally useless, and provide some quality hunting areas. Think outside the box.

**Response: Agricultural leases above the flood pool have been utilized as supplemental food sources and a resource management tool for over 20 years at the Mark Twain Lake Project. A portion of the crop at each lease site is left in the field as a food supplement for wildlife.**

Work with local organization to enhance recreational and outdoor areas.

**Response: The Corps welcomes the opportunity to partner with organizations to improve the projects facilities and natural resources.**

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From: James Burns  
Address: P.O. Box 1271, Hannibal, Missouri 63401

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34. Please keep development activity limited to those areas already designated for development.

**Response: Comment noted.**

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From: Donald Simpson, Mike Whelan, Glenn Turner – Commissioners of Monroe County  
Address: 300 North Main, Room 203, Paris, MO 65275-1399

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35. In the years to come we believe the usage of Mark Twain Lake will only increase. The increase will come from the transition of visitors using the Lake of the Ozarks to Mark Twain Lake. There seems to be a trend of the Lake of the Ozarks patrons switching to using the Mark Twain Lake because of the heavy traffic at the Lake of the Ozarks. Also, land prices in this area have increased dramatically in the last few years, main reason being the influx of recreational buyers.

**Response: Comment noted.**

## Mark Twain Lake Master Plan

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We understand the marina slips were full in 2003; this further supports the growing trend.

**Response: Comment noted.**

We suggest that your master plan not put restrictions on building a third marina till after an activity center.

**Response: Comment noted.**

We believe it is imperative for your master plan to reflect in its recommendations that a third marina AND OR activity center be built west of Highway 107 on or near the Mark Twain Lake State Park to help stimulate the growth and economic well being of the western side of the lake.

**Response: See response # 33 (1<sup>st</sup> paragraph).**

It is our belief that the land the Corps oversees surrounding Mark Twain Lake could be better managed to benefit wildlife, at no cost to the taxpayers. Land could be rented to local farmers on a share basis, and the Corps share of the crops could be left in the fields in the proper location to most benefit the wildlife. The Corps would probably have to accept a smaller share than the standard one-third/two-thirds arrangement because of the small uneven fields that are common around the lake. With modern no-till farming, erosion would not be a problem and these improvements would make for a better experience for Mark Twain Lake visitors interested in wildlife.

**Response: See response #33 (2<sup>nd</sup> paragraph).**

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From: Wanda Eubank, North Fork Project at Clarence Cannon Wholesale Water Commission

Address: 34146 Route U, Stoutsville, Missouri

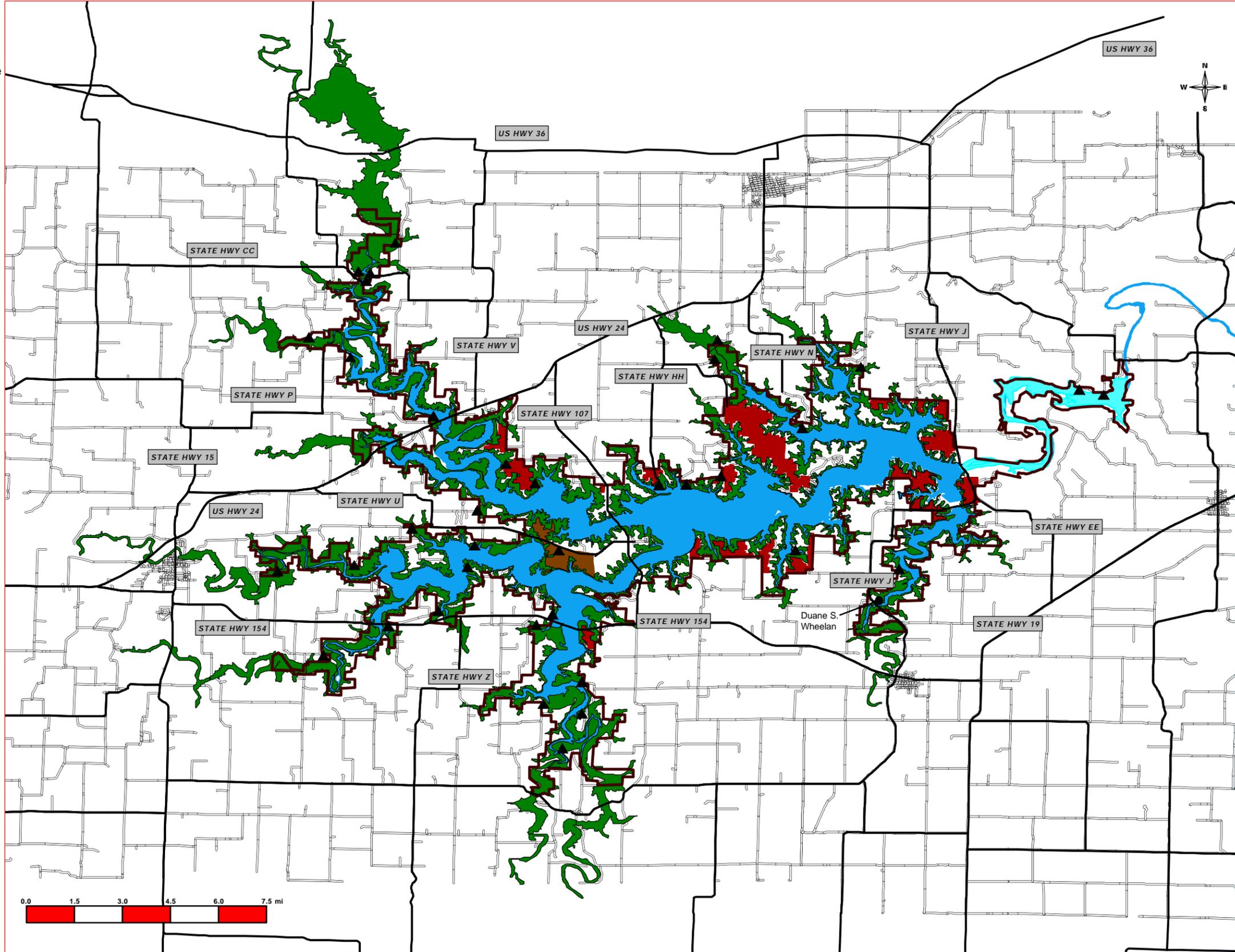
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36. Item 10.8 should be required reading for all elected officials. We are working with several communities on this issue and sources of support (financial and other) are extremely hard to find.

**Response: Comment noted.**

	Proposed Boat Launching Ramp		Boat Launching Ramp		Proposed Visitor Center		Visitor Center
	Proposed Campgrounds Area		Campground Area		Proposed Hydrant/Fountain		Picnic Site
	Proposed Comfort Station		Comfort Station		Amphitheater		Shooting Range
	Proposed Equestrian Trail		Equestrian Trail		Bath House		Trailer Dumping Station
	Proposed Fee Booth		Fee Booth		Beach		Cemeteries
	Proposed Fish Cleaning Station		Fish Cleaning Station		Comfort Station conversion to Shower Building		Hunter/ Fisherman Access Site
	Proposed Fishing Pier		Fishing Pier		Corral Shelter		Pond
	Proposed Picnic Shelter		Picnic Shelter		Fire Ring		Sewage Treatment Plant
	Proposed Playground Area		Playground Area		Hiking Trail		City Boundry
	Proposed Shower Building		Shower Building		Marina		Project Boundry
	Proposed Vault Toilet		Vault Toilet		Overlook		Proposed Roads (Gravel)
							Proposed Roads (Paved)
							Trail
							Use Boundry

- ▲ Hunter/Fisherman Access Site
- Mitigation Land
- Project Required Land
- Flood Control Pool
- Re-Regulation Pool
- Separable Recreation Land



UPDATED MASTER PLAN  
DATE OF PHOTO: 3 APRIL 1995

CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI  
LAND ALLOCATION  
MAP

U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI

**Project Operations**

- O-1 Main Dam/Saddle Dams and Outlet Works/Corps Management/Maintenance Complex
- O-2 Water Treatment Plant, Clarence Cannon Wholesale Water Commission
- O-3 Land Irrigation Type Sewage Treatment Facilities, North Extension of Mark Twain Lake State Park
- O-4 Land Irrigation Type Sewage Treatment Facilities, Indian Creek Recreation Area
- O-5 Land Irrigation Type Sewage Treatment Facilities, John F. Spalding Recreation Area
- O-6 Re-Regulation Pool
- O-7 Re-Regulation Dam

**Recreation**

- 1 M. W. Boudreaux Recreation Area
- 2 Ray Behrens Recreation Area
- 3 Robert Allen Recreation Area
- 4 South Fork Recreation Area
- 5 Mark Twain State Park
- 6 Stoutsville Recreation Area
- 7 North Fork Recreation Area
- 8 Mark Twain State Park - North Extension
- 9 Shell Branch Recreation Area
- 10 Sandy Creek Recreation Area
- 11 Indian Creek Recreation Area
- 12 John F. Spalding Recreation Area
- 13 Frank Russell Recreation Area
- 14 Warren G. See Spillway Recreation Area
- 15 Bluff View Recreation Area

**Multiple Resource Management Wildlife Management- General**

MW-1 Upper End MRA

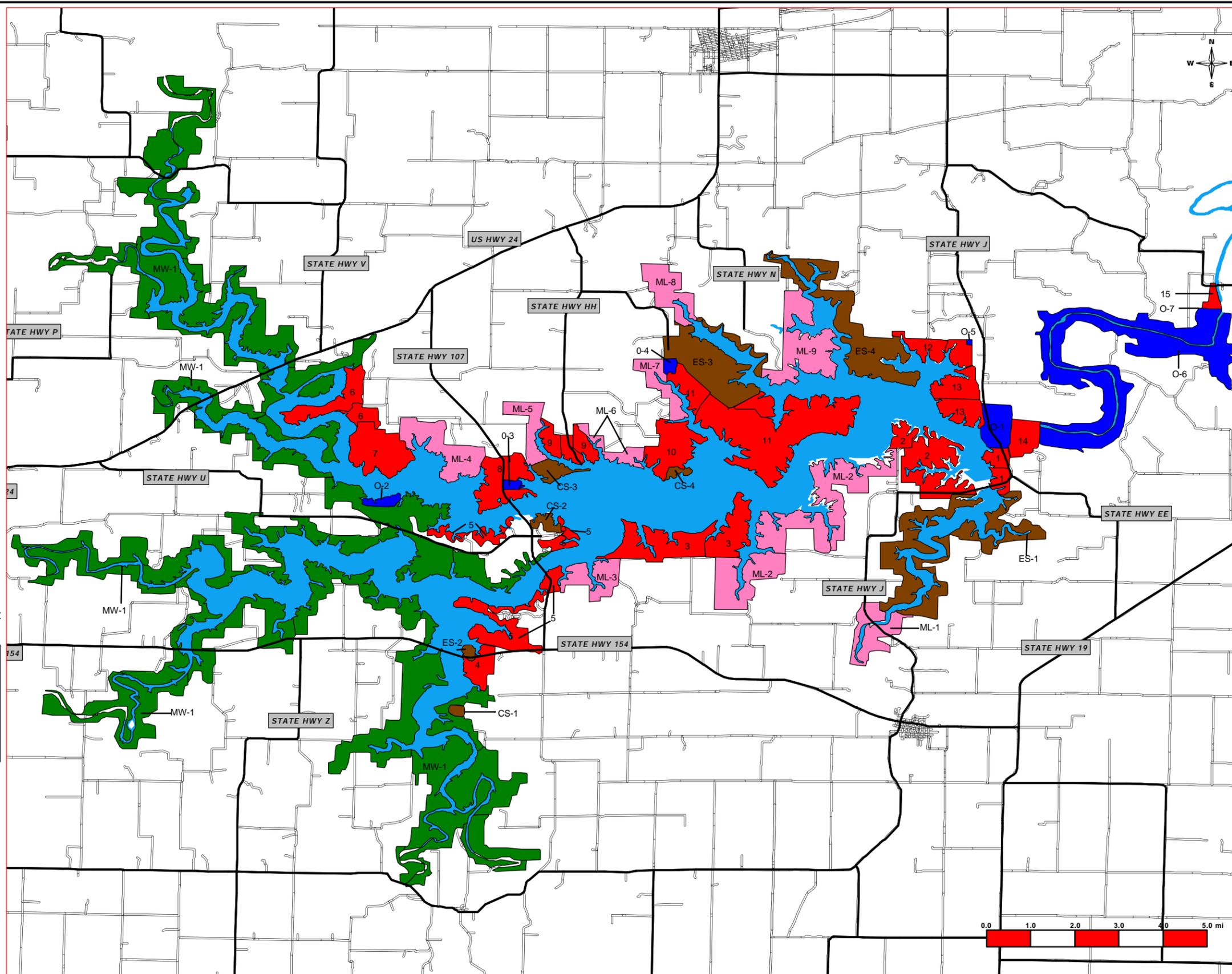
**Multiple Resource Management Recreation- Low Density**

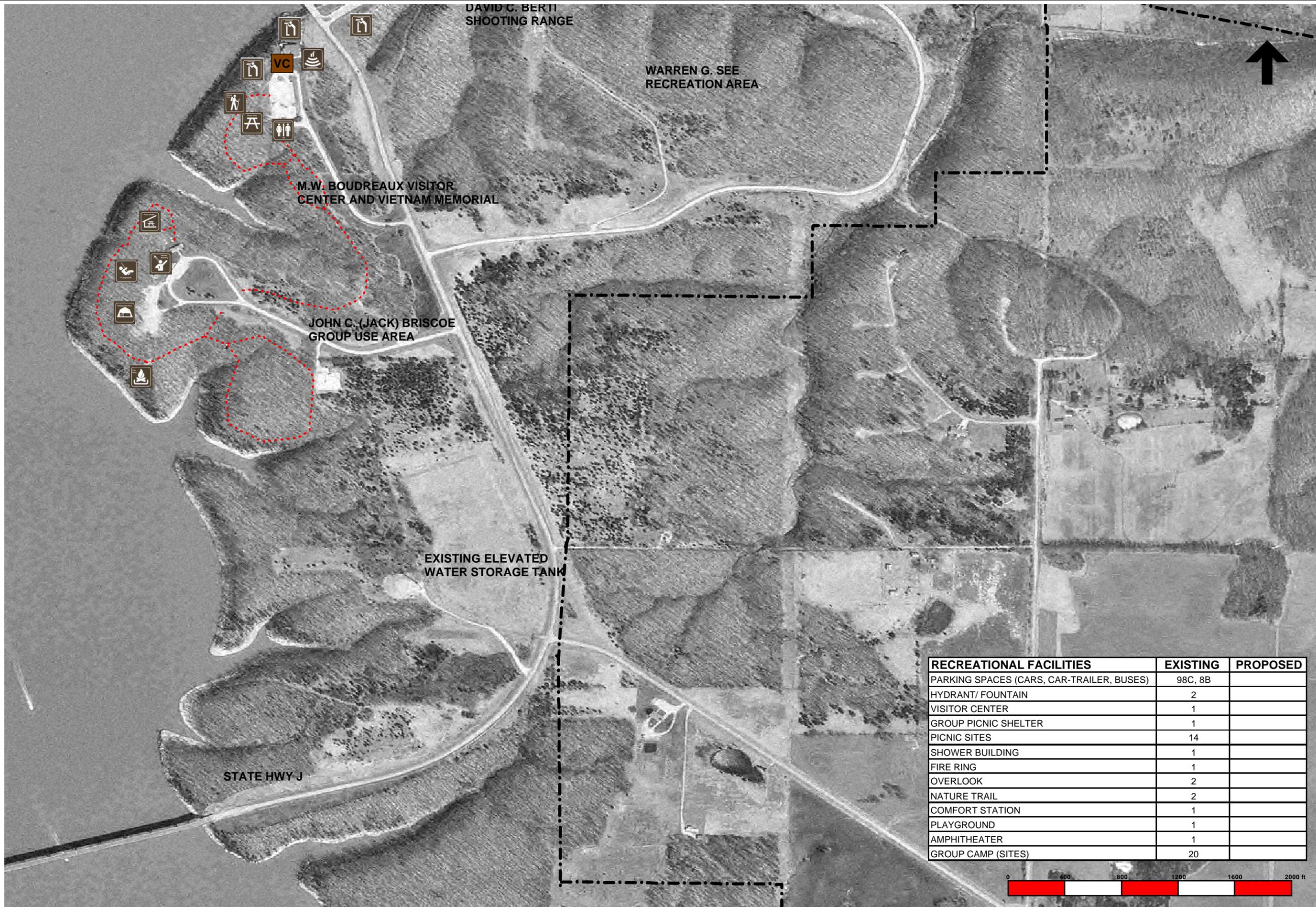
- ML-1 Lick Creek MRA
- ML-2 Pigeon Roost MRA
- ML-3 Allen MRA
- ML-4 North Fork MRA
- ML-5 Shell Branch MRA
- ML-6 Crigler MRA
- ML-7 Sandy Creek MRA
- ML-8 Indian Creek Upper Drainage MRA
- ML-9 Little Indian MRA

**Environmental Sensitive Cultural/ Ecological**

- ES-1 Lick Creek
- ES-2 Quarry Lake, South Fork Salt River
- ES-3 Indian Creek Environmental Sensitive Area
- ES-4 Little Indian Creek Drainage Area (Joanna Ridge)
- CS-1 Hatten Mounds
- CS-2 Pollard Cemetery
- CS-3 Shell Branch Village Sites
- CS-4 Crigler Mounds

See Table 8.06 in the Resource Plan for acreage figures





RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILER, BUSES)	98C, 8B	
HYDRANT/ FOUNTAIN	2	
VISITOR CENTER	1	
GROUP PICNIC SHELTER	1	
PICNIC SITES	14	
SHOWER BUILDING	1	
FIRE RING	1	
OVERLOOK	2	
NATURE TRAIL	2	
COMFORT STATION	1	
PLAYGROUND	1	
AMPHITHEATER	1	
GROUP CAMP (SITES)	20	



US Army Corps of Engineers  
St. Louis District

UPDATED MASTER PLAN

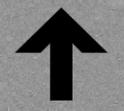
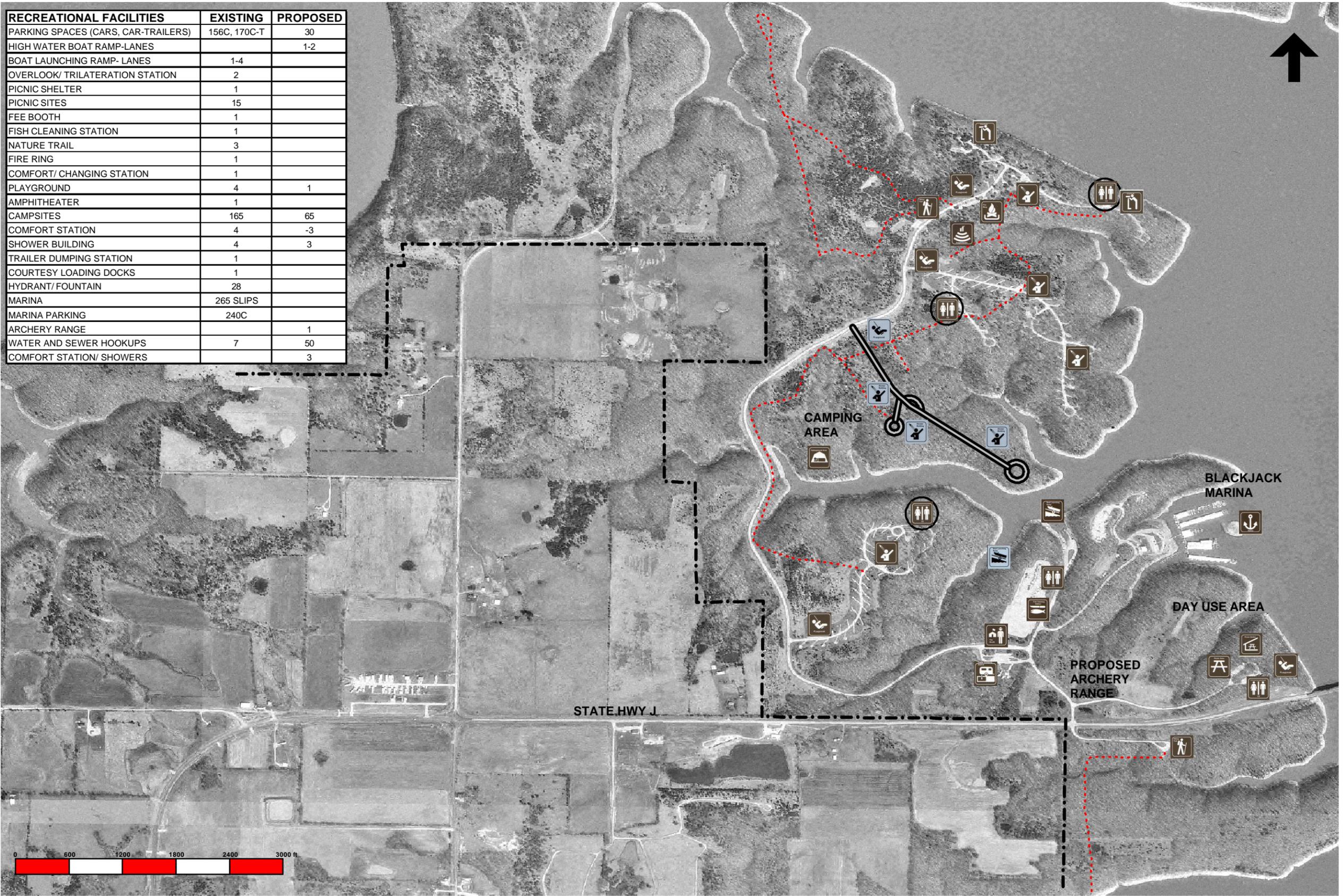
DATE OF PHOTO: 3 APRIL 1995

CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI  
M. W. BOUDREUX RECREATION  
AREA 1

U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI

PLATE  
3

RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	156C, 170C-T	30
HIGH WATER BOAT RAMP-LANES		1-2
BOAT LAUNCHING RAMP- LANES	1-4	
OVERLOOK/ TRILATERATION STATION	2	
PICNIC SHELTER	1	
PICNIC SITES	15	
FEE BOOTH	1	
FISH CLEANING STATION	1	
NATURE TRAIL	3	
FIRE RING	1	
COMFORT/ CHANGING STATION	1	
PLAYGROUND	4	1
AMPHITHEATER	1	
CAMPSITES	165	65
COMFORT STATION	4	-3
SHOWER BUILDING	4	3
TRAILER DUMPING STATION	1	
COURTESY LOADING DOCKS	1	
HYDRANT/ FOUNTAIN	28	
MARINA	265 SLIPS	
MARINA PARKING	240C	
ARCHERY RANGE		1
WATER AND SEWER HOOKUPS	7	50
COMFORT STATION/ SHOWERS		3

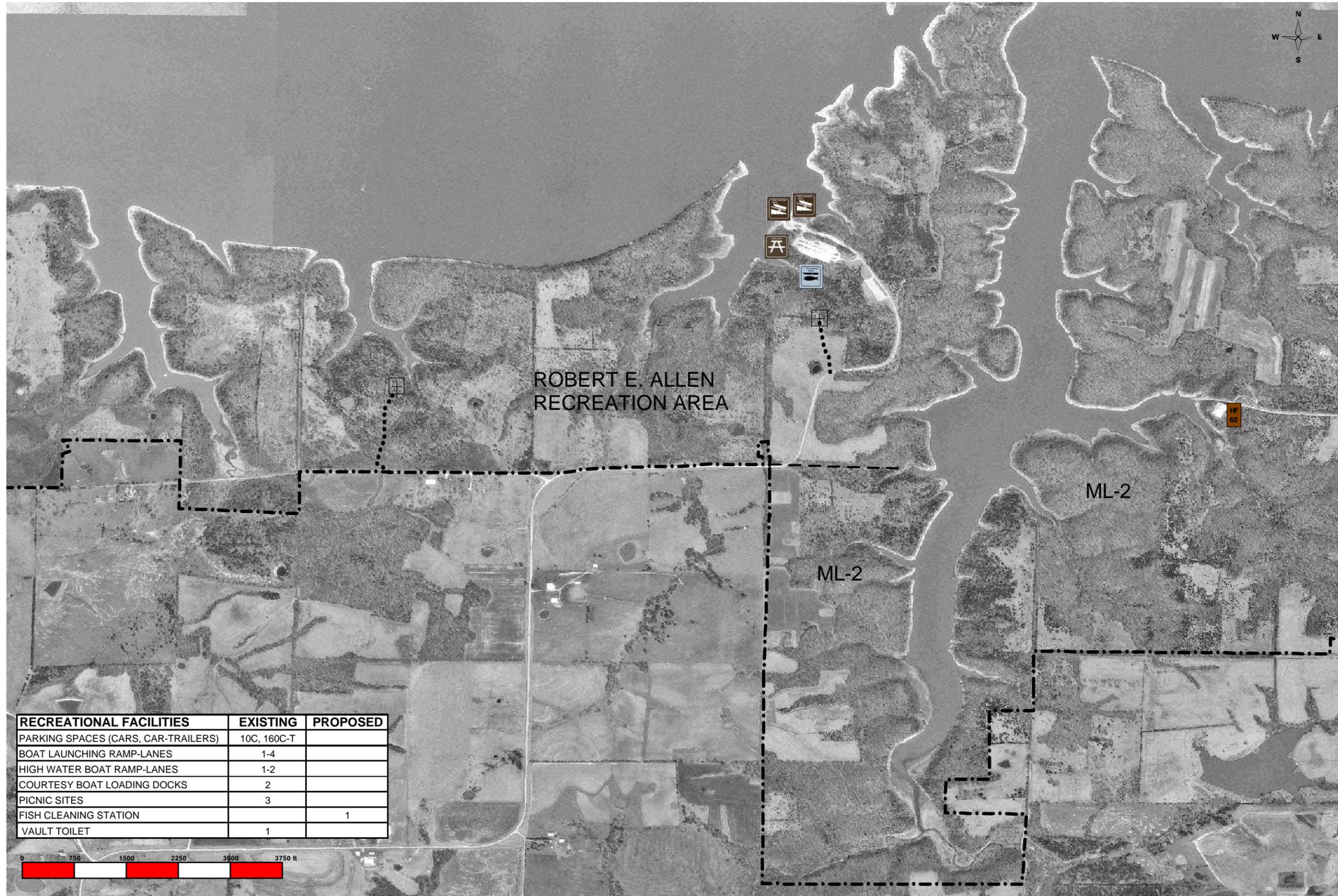


CLARENCE CANNON DAM & MARK  
 TWIN LAKE-SALT RIVER, MISSOURI  
 RAY BEHRENS RECREATION  
 AREA 2

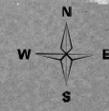
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 CORPS OF ENGINEERS  
 ST. LOUIS, MISSOURI

**PLATE**  
**4**



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	10C, 160C-T	
BOAT LAUNCHING RAMP-LANES	1-4	
HIGH WATER BOAT RAMP-LANES	1-2	
COURTESY BOAT LOADING DOCKS	2	
PICNIC SITES	3	
FISH CLEANING STATION		1
VAULT TOILET	1	



  
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CLARENCE CANNON DAM & MARK  
 TWIN LAKE-SALT RIVER, MISSOURI  
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ROBERT E. ALLEN RECREATION  
 AREA 3

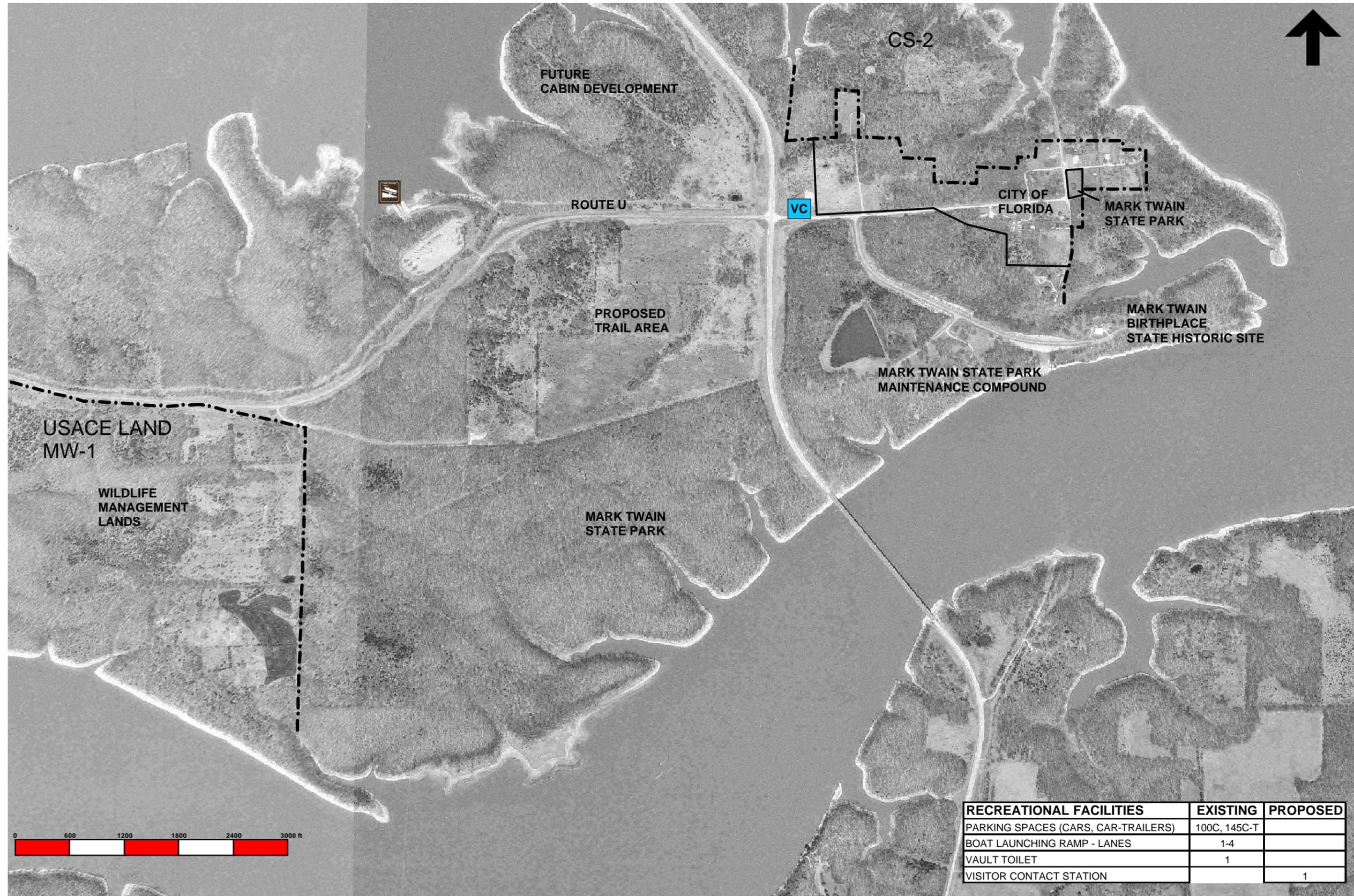
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 ST. LOUIS, MISSOURI

**PLATE**  
**5**



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	15C, 120C-T	30
BOAT LAUNCHING RAMP-LANES	1-4	
COURTESY BOAT DOCKS	2	
PICNIC SITES	3	
FISH CLEANING STATION		1
VAULT TOILET	1	





RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	100C, 145C-T	
BOAT LAUNCHING RAMP - LANES	1-4	
VAULT TOILET	1	
VISITOR CONTACT STATION		1



**US Army Corps  
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**CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI**

**MARK TWAIN STATE PARK  
AREA 5**

**U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI**

**UPDATED MASTER PLAN**

**DATE OF PHOTO: 3 APRIL 1999**

**PLATE  
7**



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	35C, 145C-T	
BOAT LAUNCHING RAMP- LANES	1-4	
HIGH WATER BOAT RAMP- LANES	1	
COURTESY BOAT LOADING DOCK	2	
PICNIC SITES	3	
FISH CLEANING STATION	1	
VAULT TOILET	1	

STOUTSVILLE RECREATION AREA

Area 7





Area 7

ML-4

GREENING CEMETERY

FIELD ROADS TO CEMETERIES

NORTH FORK RECREATION AREA

McCREERY CEMETERY



HF 26

HF 25



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)		20
BOAT LAUNCHING RAMP- LANES	1-4	
VAULT TOILET		1



US Army Corps of Engineers  
St. Louis District

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CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI

NORTH FORK RECREATION  
AREA 7

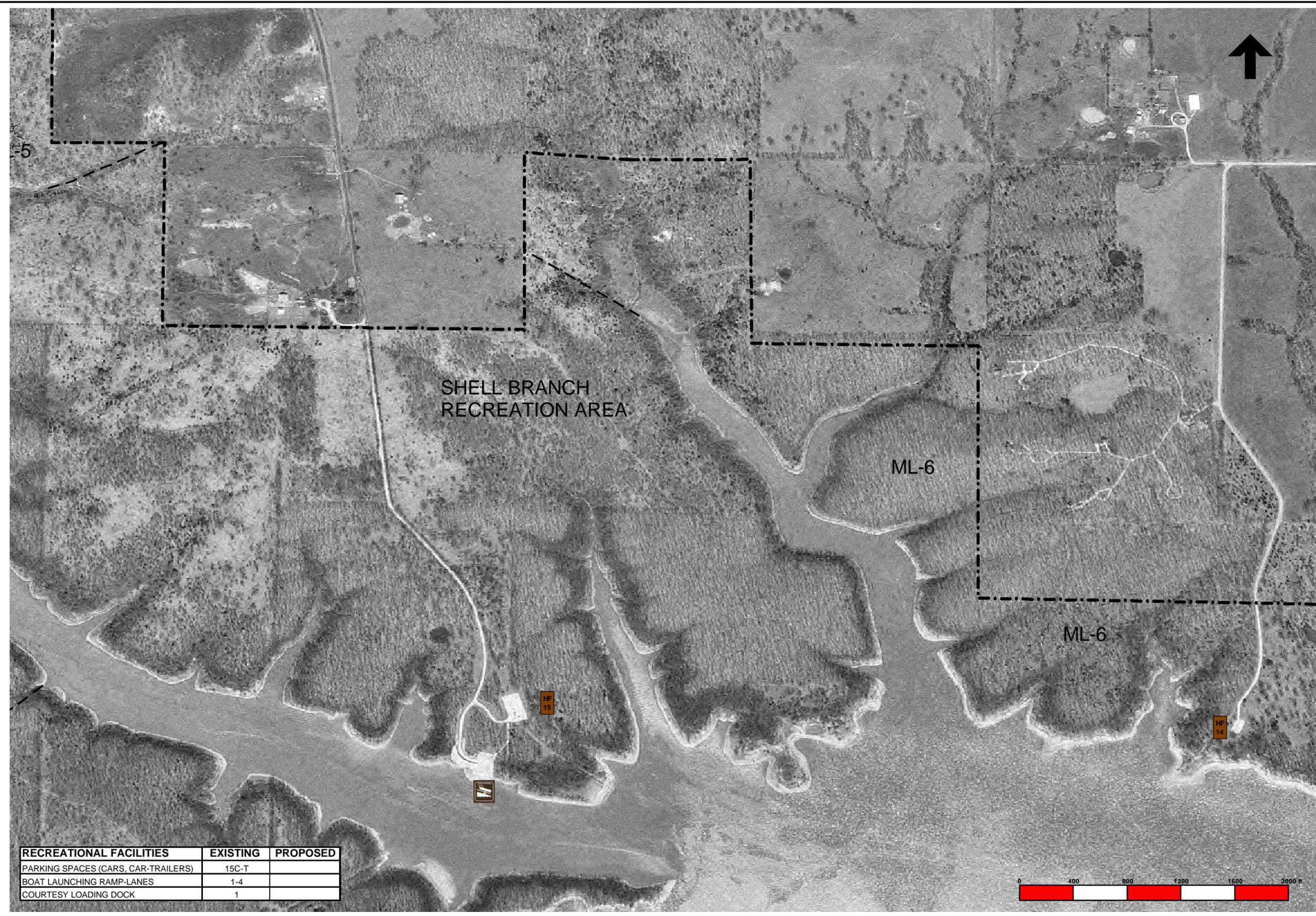
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CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI

**PLATE**  
**9**



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	85C, 120C-T	50
BOAT LAUNCHING RAMP- LANES	1-4	
PICNIC SITES	13	
FISH CLEANING STATION		1
SWIMMING FACILITIES	1	
LAND IRRIGATION (SEWAGE TREATMENT)	1	
HYDRANT/ FOUNTAIN	2	
VAULT TOILET	2	1
DINING HALL	1	
OFFICE INFIRMARY	1	
GROUP CAMPING AREA (4-17 CAMPER CABINS)	1	
EQUESTRIAN TRAILHEAD		1
EQUESTRIAN CAMP SITES		6
BEACH	1	
PLAYGROUND	1	
CHANGE HOUSE	1	
WASH HOUSE	1	





RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	15C-T	
BOAT LAUNCHING RAMP-LANES	1-4	
COURTESY LOADING DOCK	1	





RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	10	

  
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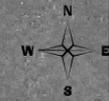
CLARENCE CANNON DAM & MARK  
 TWIN LAKE-SALT RIVER, MISSOURI  
 SANDY CREEK RECREATION  
 AREA 10

U.S. ARMY ENGINEER DIVISION  
 CORPS OF ENGINEERS  
 ST. LOUIS, MISSOURI

**PLATE**  
**12**

CRIGLER MOUNDS  
 (CS-4)  
 CRIGLER  
 CEMETERY

BANNISTER  
 CEMETERY  

EXISTING WASTE WATER  
LAND TREATMENT FACILITY

FUTURE RECREATION

INDIAN CREEK  
ENVIRONMENTAL  
SENSITIVE  
AREA (ES-3)

ML-7

GROUP CAMP

EXISTING ELEVATED  
WATER STORAGE TANK

RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	370C, 207C-T	
BOAT LAUNCHING RAMP-LANES	1-1, 1-4	
HIGH WATER BOAT RAMP-LANES	1	
FISHING PIERS		1
PICNIC SHELTER	2	
PICNIC SITES	13	
FEEBOOTH	1	1
FISH CLEANING STATION	2	
GROUP CAMP (SITES) TENT	12	
BEACH	1	
COMFORT/ CHANGING STATION	1	
PLAYGROUND	4	2
AMPHITHEATER	1	
CAMP SITES	190	75
COMFORT STATION	6	-3,1
SHOWER BUILDING	6	2
TRAILER DUMPING STATION	2	
WASTEWATER LAND IRRIGATION	1	
HYDRANT/FOUNTAIN	22	9
GROUP CAMP (SITES) TRAILERS	25	
CAMP SITE (HIKE-IN-TENT)	20	
VAULT TIOLET	3	
COURTESY BOAT LOADING DOCKS	2	
FIRE RING	1	
NATURE TRAIL	1	
MARINA	1	
MARINA PARKING AREA	150	
MARINA BOAT LAUNCHING RAMP-LANES	1-2	
COMFORT/ CHANGING STATION (VAULT)		1
COMFORT STATION/ SHOWERS		3
WATER AND SEWER HOOKUPS	12	50
PRIMITIVE EQUESTRIAN CAMP		1



HP  
13

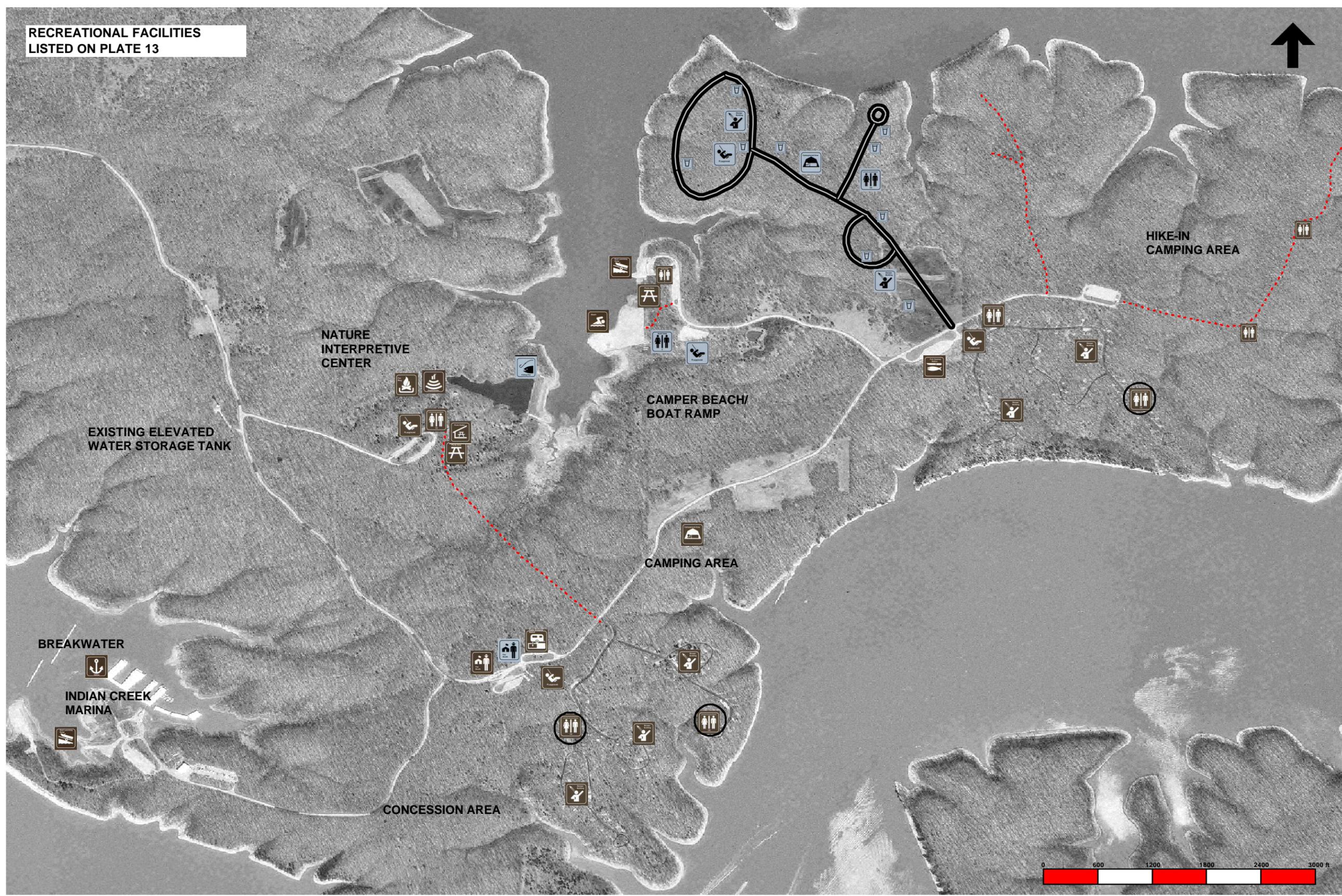
CLARENCE CANNON DAM & MARK  
 TWIN LAKE-SALT RIVER, MISSOURI  
 INDIAN CREEK RECREATION  
 AREA11  
 UPDATED MASTER PLAN  
 DATE OF PHOTO: 3 APRIL 1995

U.S. ARMY ENGINEER DIVISION  
 CORPS OF ENGINEERS  
 ST. LOUIS, MISSOURI

RECREATIONAL FACILITIES LISTED ON PLATE 13



US Army Corps of Engineers  
St. Louis District



UPDATED MASTER PLAN

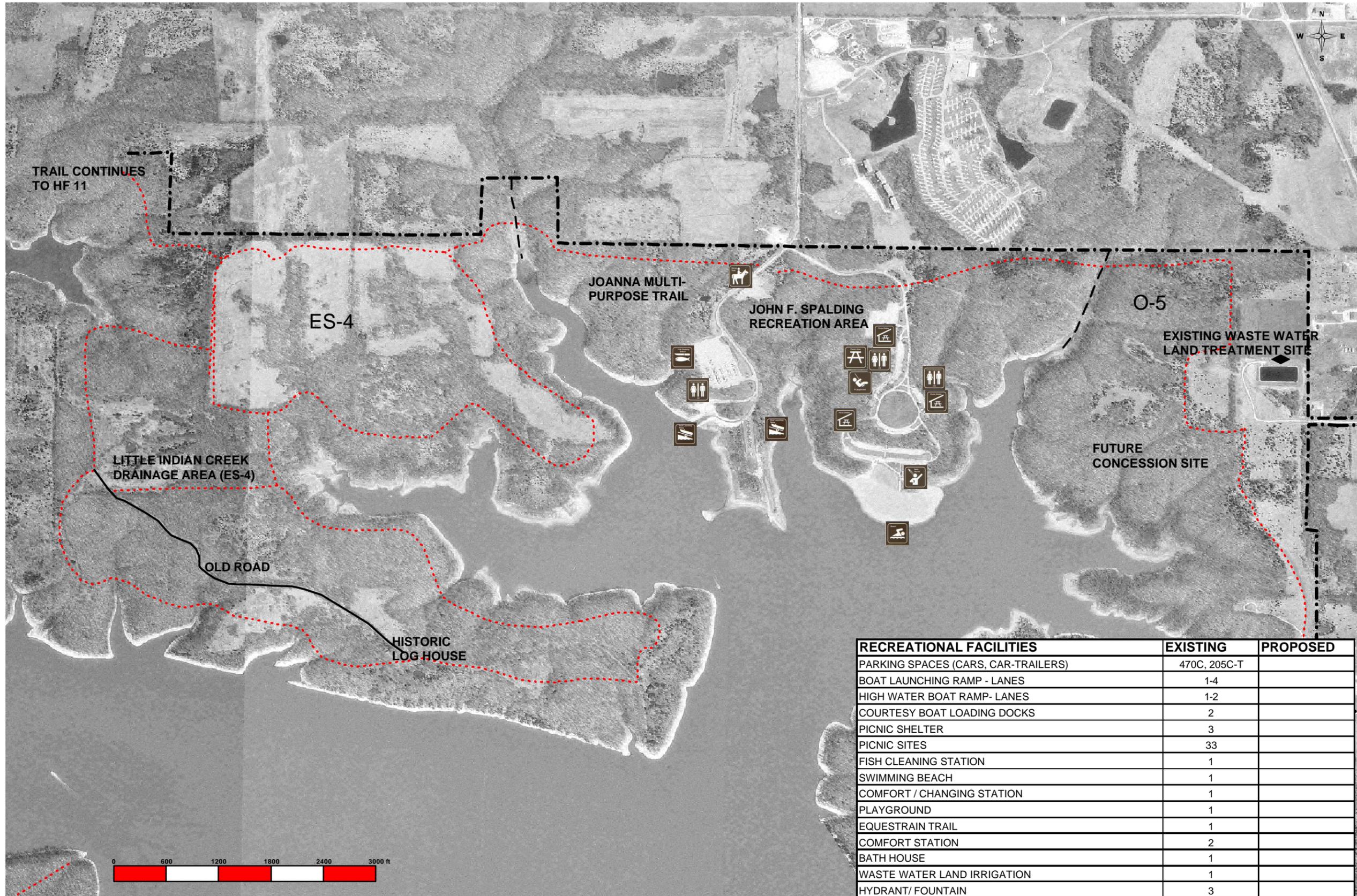
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CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI  
INDIAN CREEK RECREATION AREA  
AREA 11

U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI



PLATE  
14



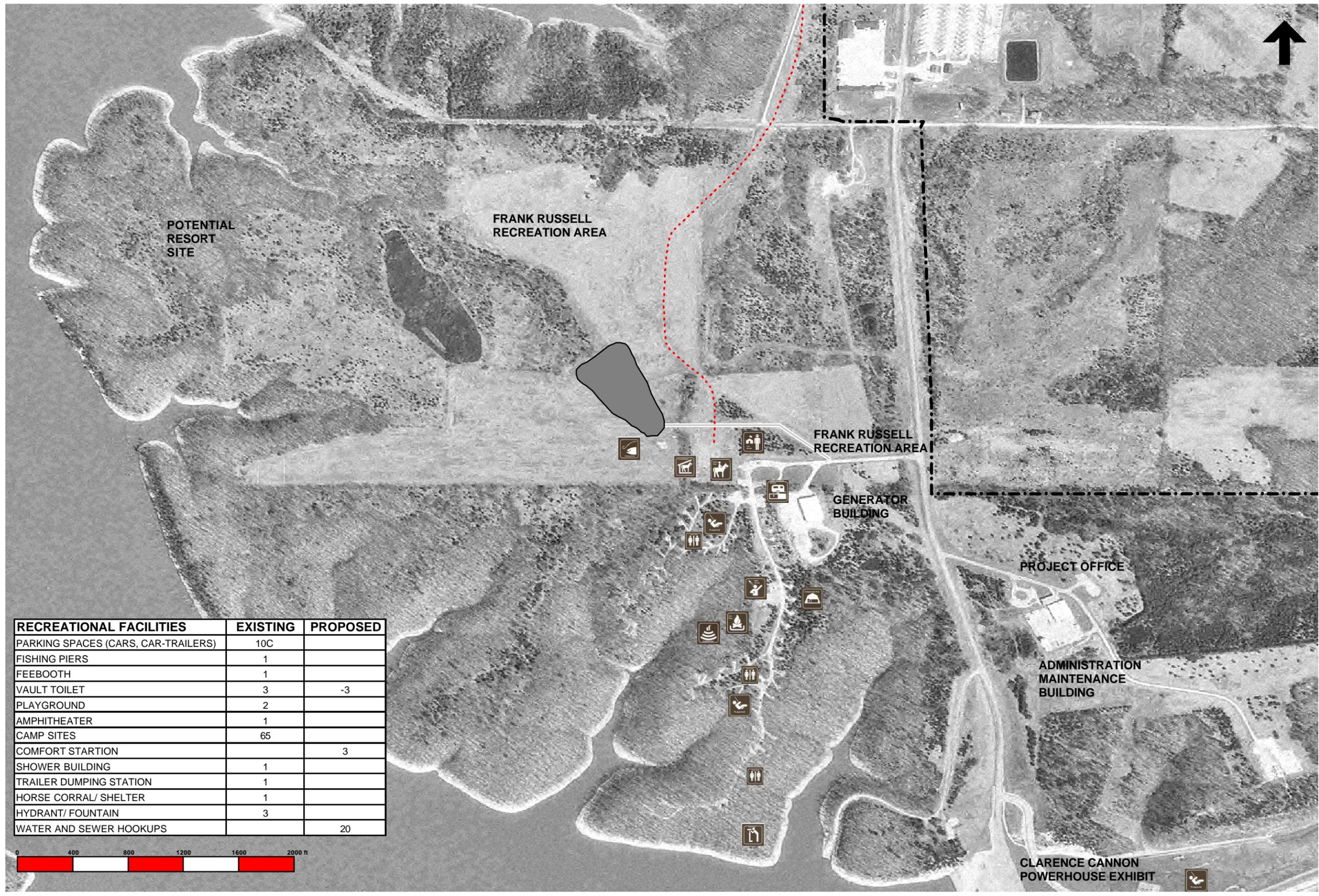
RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	470C, 205C-T	
BOAT LAUNCHING RAMP - LANES	1-4	
HIGH WATER BOAT RAMP- LANES	1-2	
COURTESY BOAT LOADING DOCKS	2	
PICNIC SHELTER	3	
PICNIC SITES	33	
FISH CLEANING STATION	1	
SWIMMING BEACH	1	
COMFORT / CHANGING STATION	1	
PLAYGROUND	1	
EQUESTRAIN TRAIL	1	
COMFORT STATION	2	
BATH HOUSE	1	
WASTE WATER LAND IRRIGATION	1	
HYDRANT/ FOUNTAIN	3	



UPDATED MASTER PLAN  
DATE OF PHOTO: 3 APRIL 1995

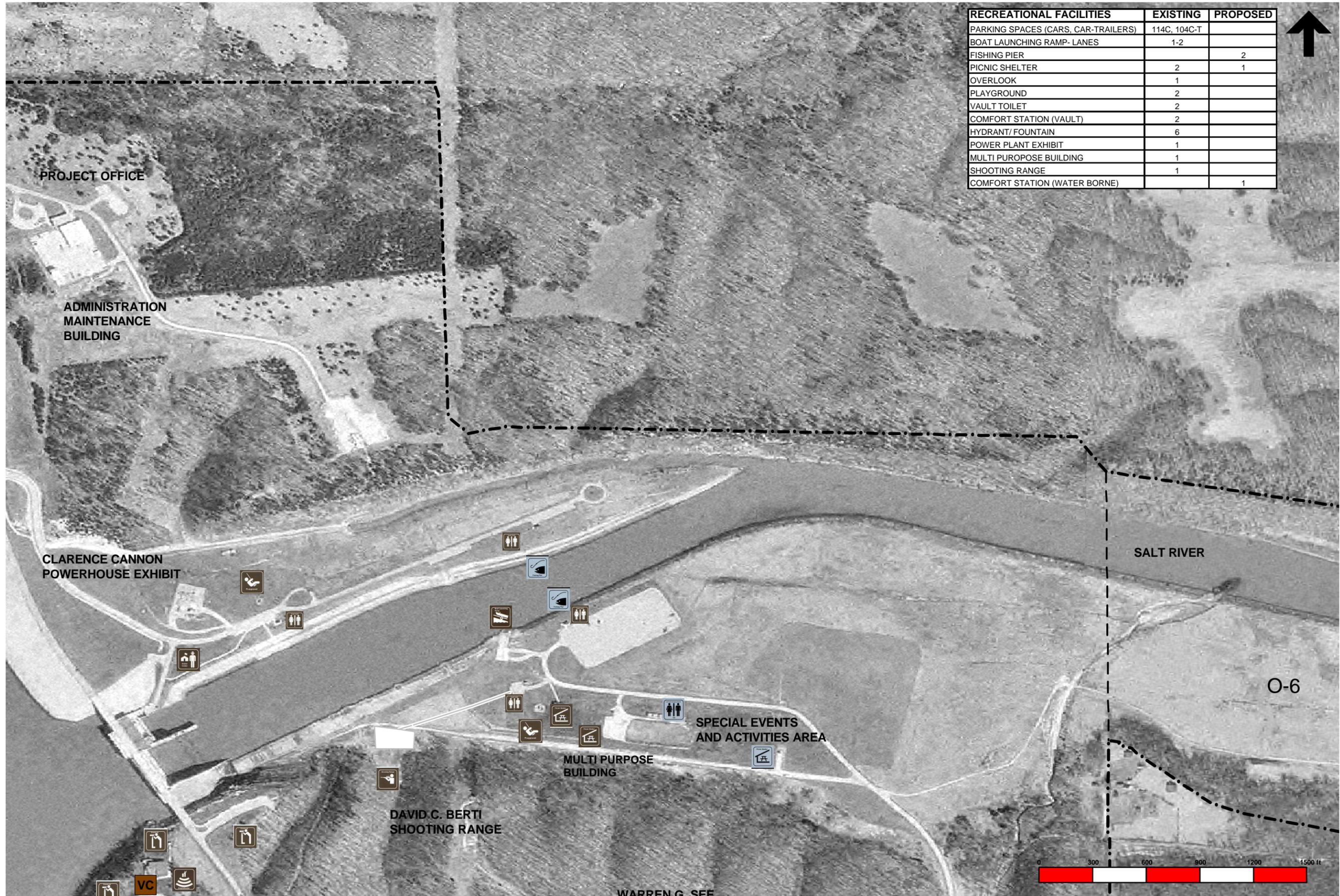
CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI  
FRANK RUSSELL RECREATION  
AREA 13

U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	10C	
FISHING PIERS	1	
FEEBOOTH	1	
VAULT TOILET	3	-3
PLAYGROUND	2	
AMPHITHEATER	1	
CAMP SITES	65	
COMFORT STARTION		3
SHOWER BUILDING	1	
TRAILER DUMPING STATION	1	
HORSE CORRAL/ SHELTER	1	
HYDRANT/ FOUNTAIN	3	
WATER AND SEWER HOOKUPS		20





RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	114C, 104C-T	
BOAT LAUNCHING RAMP- LANES	1-2	
FISHING PIER		2
PICNIC SHELTER	2	1
OVERLOOK	1	
PLAYGROUND	2	
VAULT TOILET	2	
COMFORT STATION (VAULT)	2	
HYDRANT/ FOUNTAIN	6	
POWER PLANT EXHIBIT	1	
MULTI PUROPOSE BUILDING	1	
SHOOTING RANGE	1	
COMFORT STATION (WATER BORNE)		1



  
 US Army Corps  
 of Engineers  
 St. Louis District

CLARENCE CANNON DAM & MARK  
 TWAIN LAKE-SALT RIVER, MISSOURI  
 SPILLWAY RECREATION  
 AREA 14

U.S. ARMY ENGINEER DIVISION  
 CORPS OF ENGINEERS  
 ST. LOUIS, MISSOURI

PLATE  
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UPDATED MASTER PLAN  
 DATE OF PHOTO: 3 APRIL 1995

PROJECT OFFICE

ADMINISTRATION  
 MAINTENANCE  
 BUILDING

CLARENCE CANNON  
 POWERHOUSE EXHIBIT

SALT RIVER

O-6

SPECIAL EVENTS  
 AND ACTIVITIES AREA

MULTI PURPOSE  
 BUILDING

DAVID.C. BERTI  
 SHOOTING RANGE

WARREN G. SEE



RECREATIONAL FACILITIES	EXISTING	PROPOSED
PARKING SPACES (CARS, CAR-TRAILERS)	83C, 20C-T	
BOAT LAUNCHING RAMP-LANES	1-1	
PICNIC SHELTER	1	
PICNIC SITES	4	
FISH CLEANING STATION		1
VAULT TOILET	2	
PLAYGROUND	1	



US Army Corps  
of Engineers  
St. Louis District

UPDATED MASTER PLAN  
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CLARENCE CANNON DAM & MARK  
TWIN LAKE-SALT RIVER, MISSOURI

BLUFF VIEW RECREATION  
AREA 15

U.S. ARMY ENGINEER DIVISION  
CORPS OF ENGINEERS  
ST. LOUIS, MISSOURI

PLATE  
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