

## **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 lot sitings will be located 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, and the Graphic Standards Manual, EP 310-106.

9.08 INTERPRETIVE FACILITIES - 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 an 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 times a day.

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, utilizing 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 projects 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 psi residual pressure under peak flow conditions. The future water system modifications are expected to be a 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.

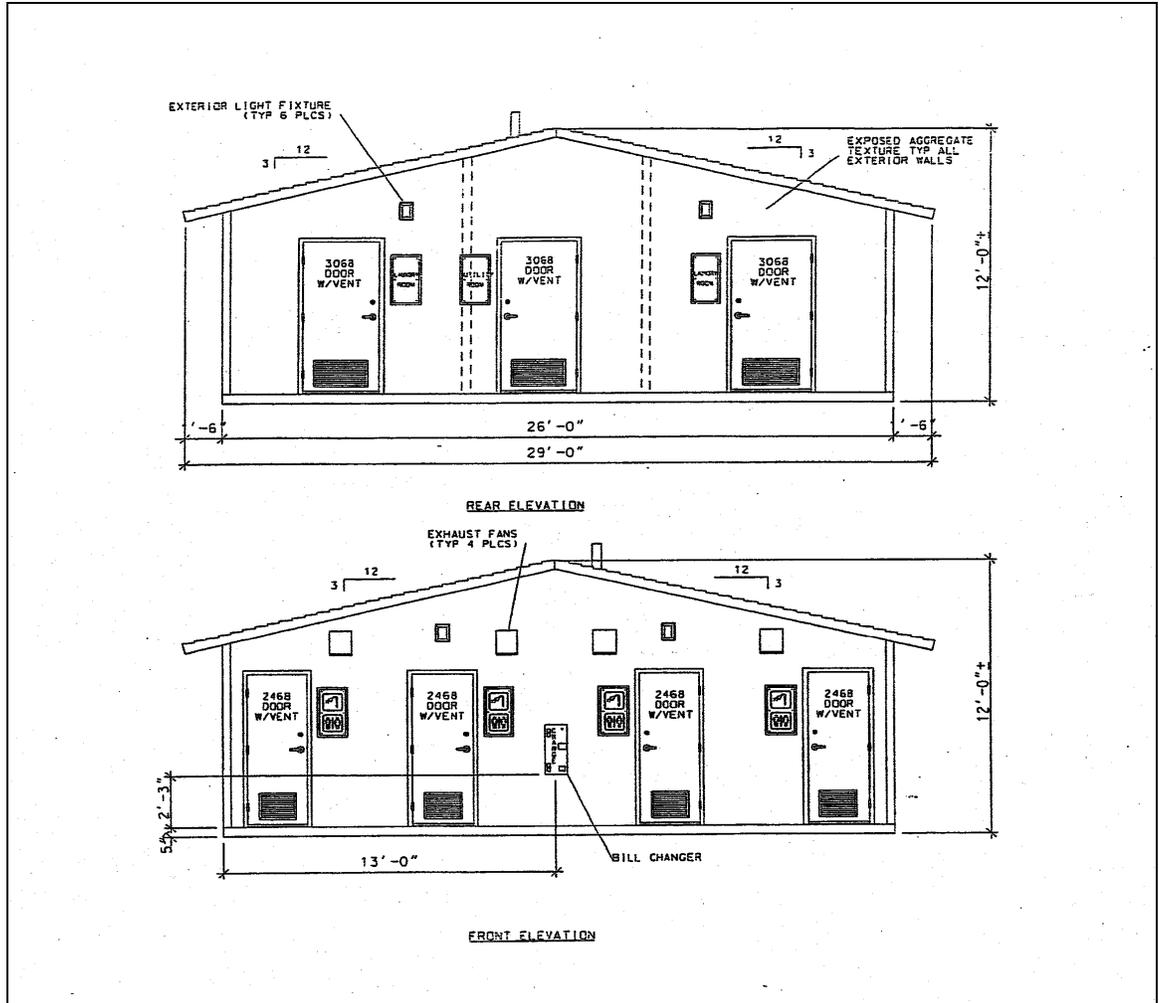
Water mains are sized at peak flows to maintain required residual pressures for plumbing fixtures with reserve capacity for future project development.

#### 9.11 TYPICAL DRAWINGS FOR PROPOSED FACILITIES

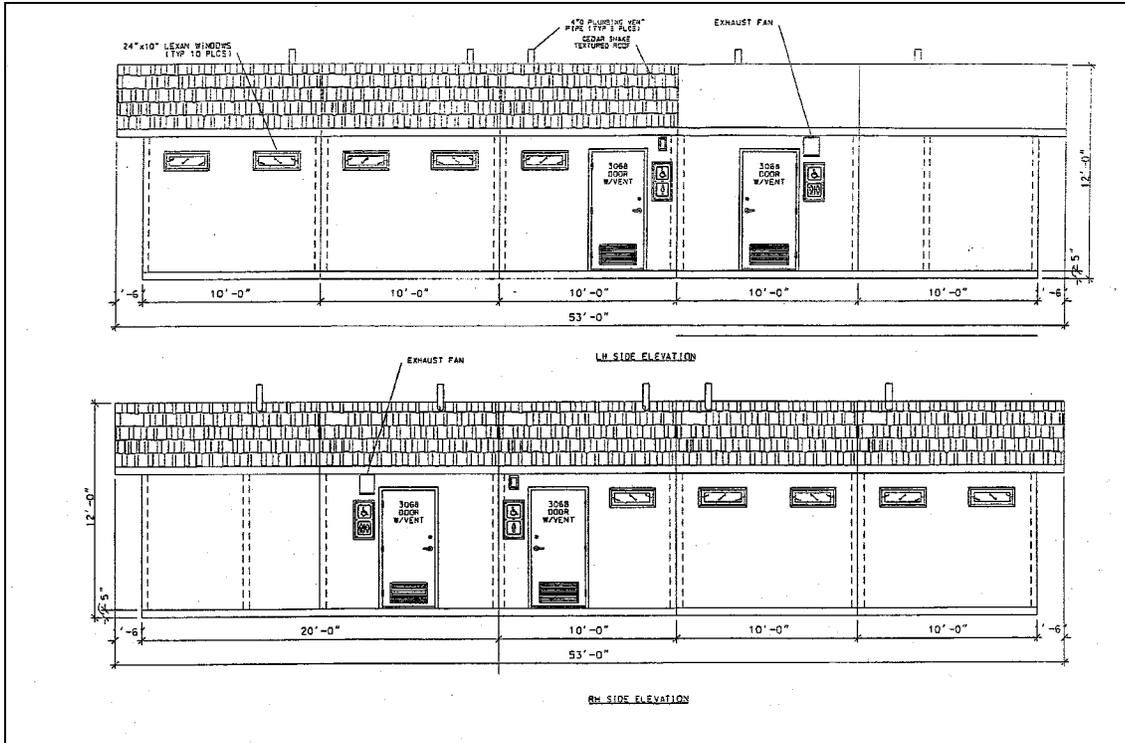
Typicals for proposed facilities are shown below. Three of the drawings present the components configured as a shower building. The shower building is composed of four modules. These modules can be configured in a variety of ways to create buildings such as comfort stations, mini-shower buildings, and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

Other typicals show a standardized design for a comfort station and a campground fee booth.

In addition, typicals are shown for a picnic shelter, amphitheater, playground, fishing pier, boat launching ramp, park roads, campsites, camper hookups, fire ring, picnic table and grills.

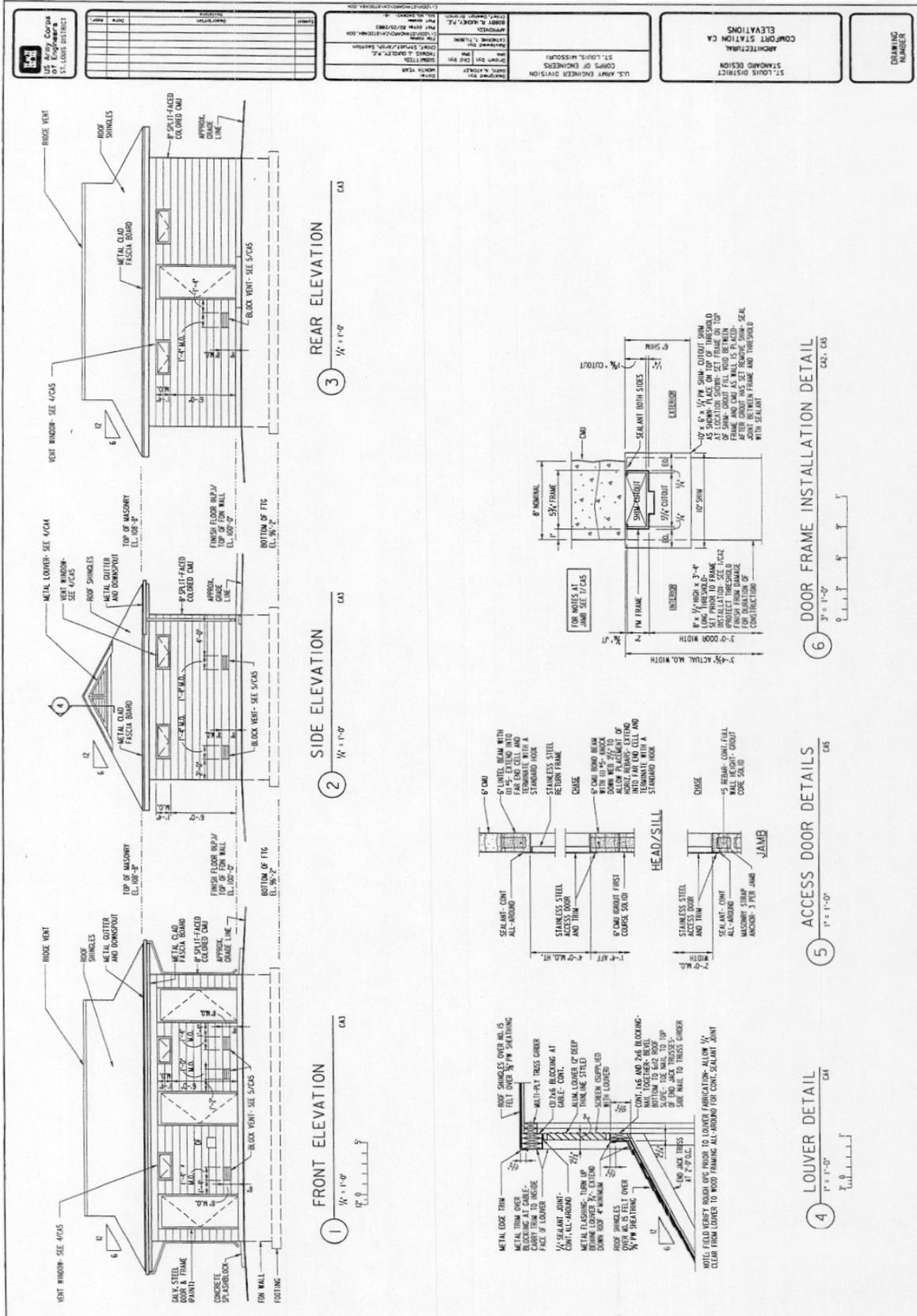


Typical Shower Building – Front Elevation

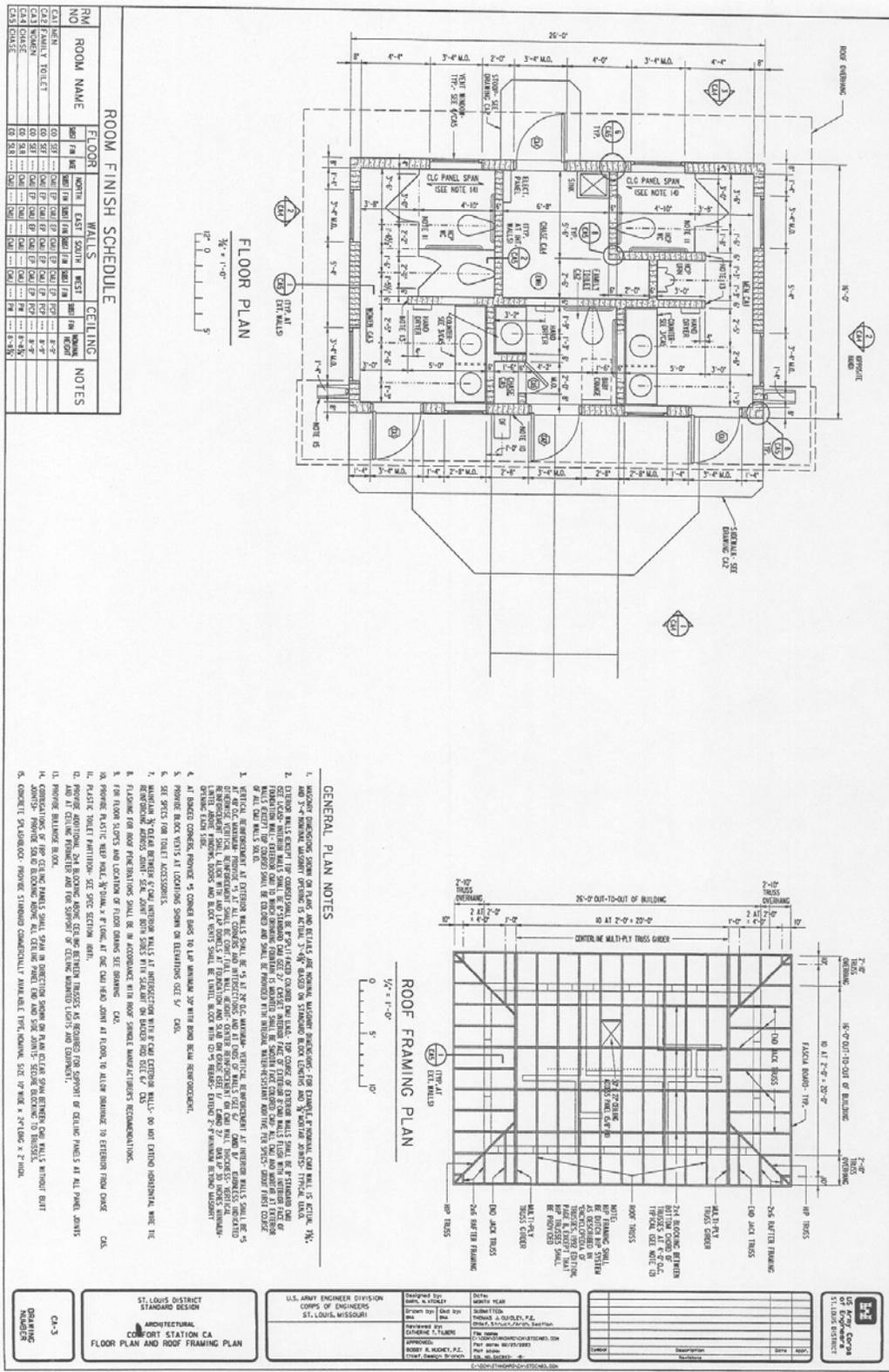


Typical Shower Building - Side Elevation

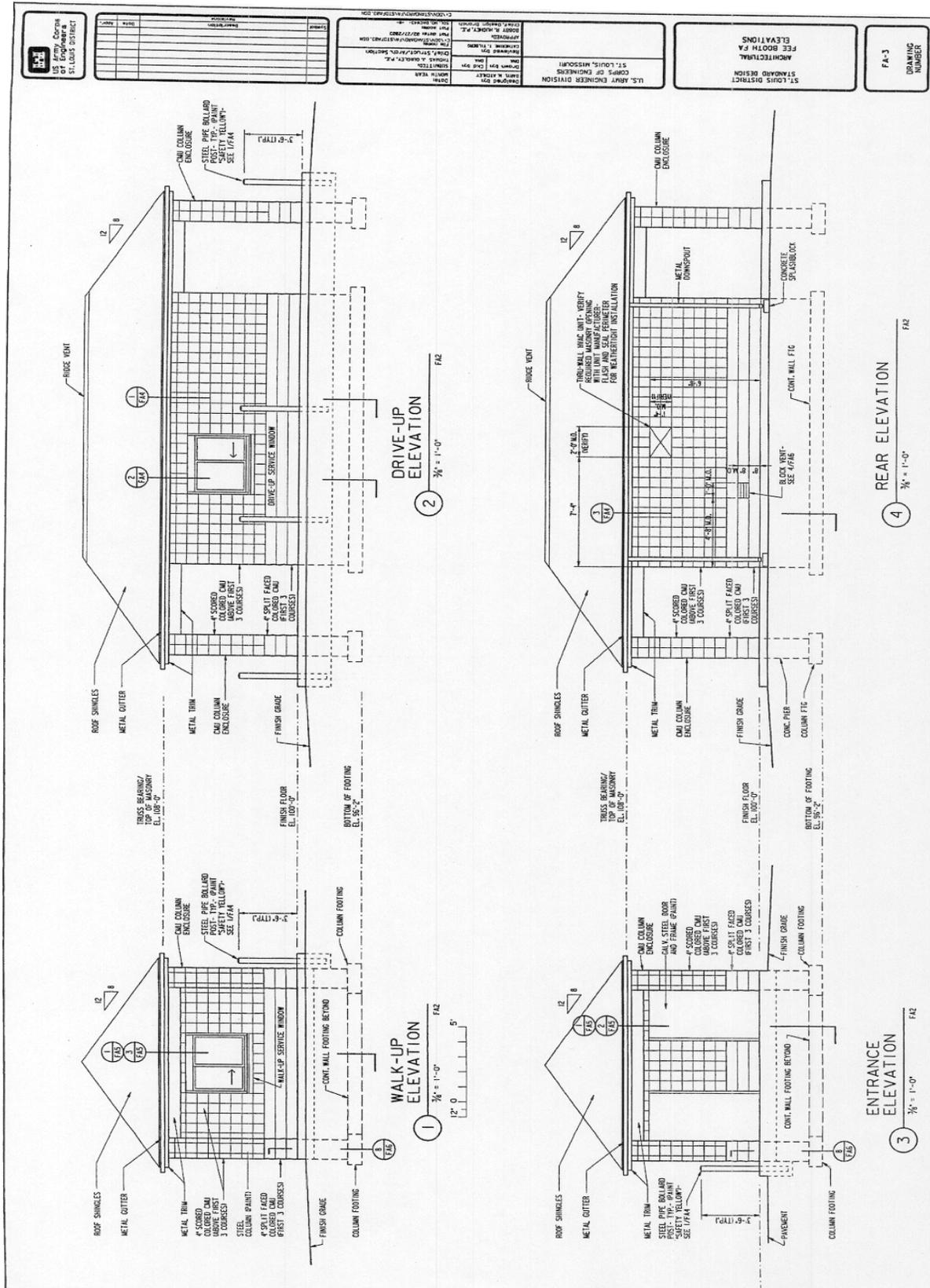




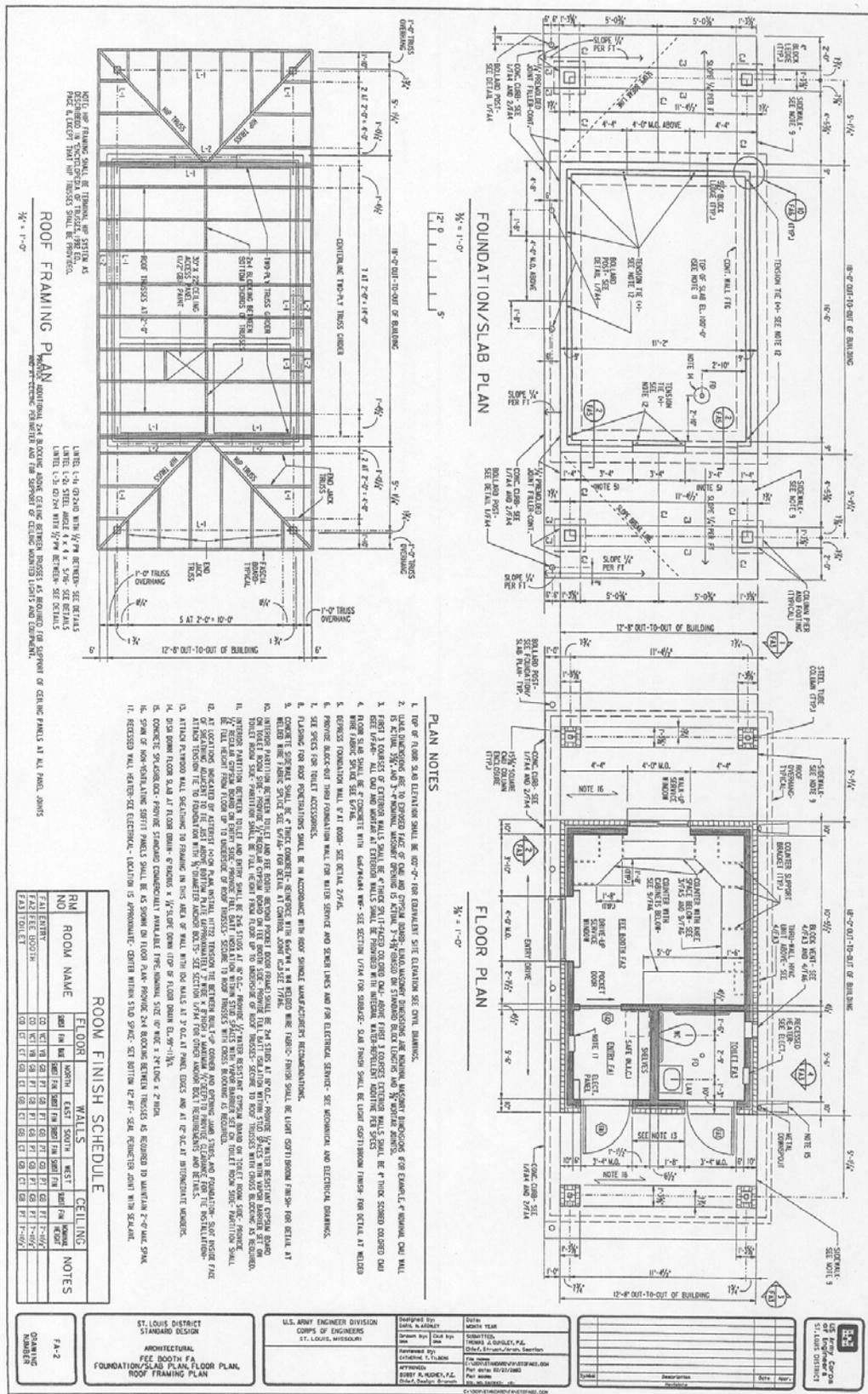
Comfort Station - Elevation



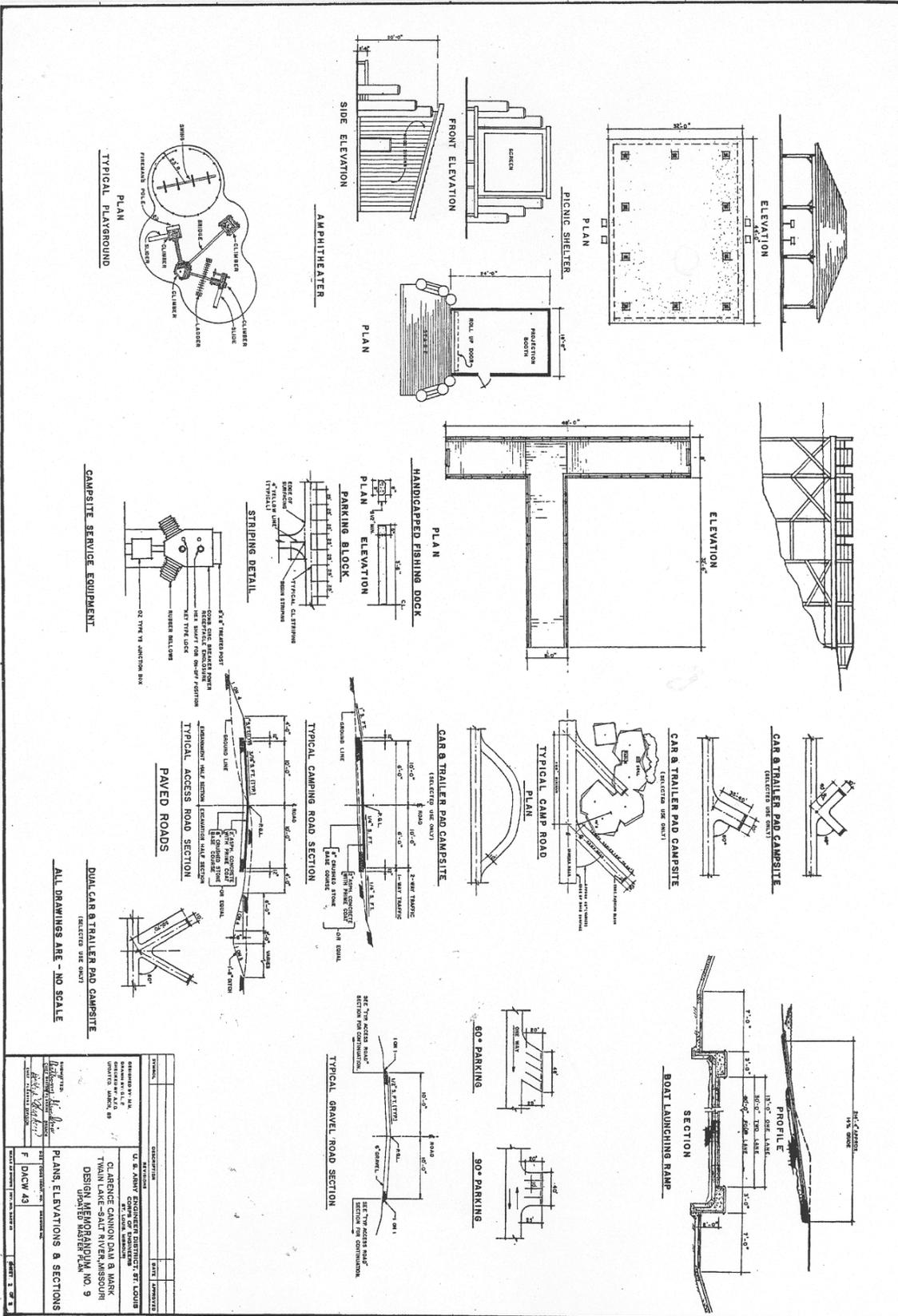
Comfort Station – Floor Plan



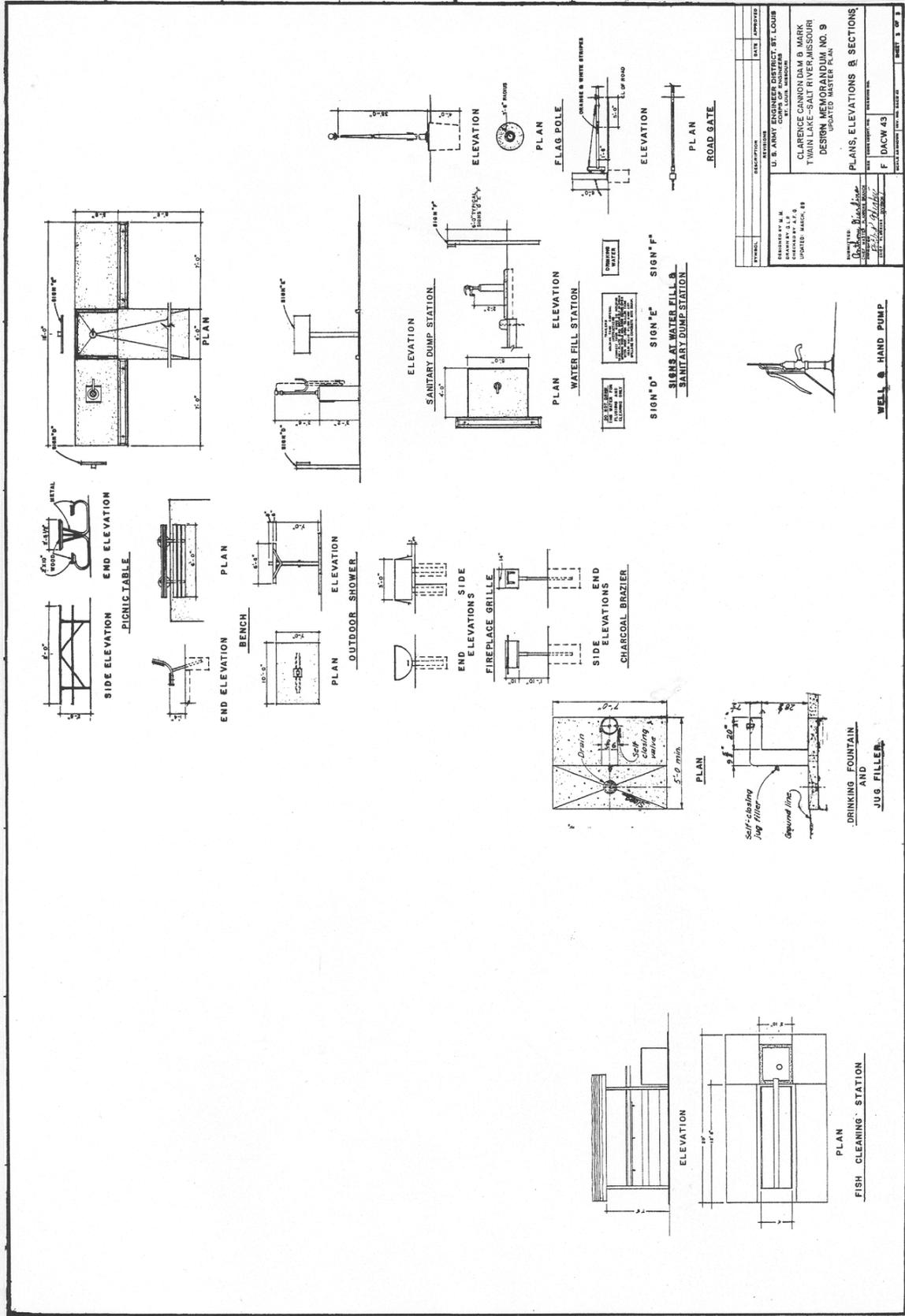
Fee Booth - Elevation



Fee Booth - Plan



Plans, Elevations and Sections



SYMBOL	DESCRIPTION	DATE	APPROVED
	U. S. ARMY ENGINEER DISTRICT, ST. LOUIS		
	CLARENCE CANNON DAM & MARK TWAIN LAKE-SALT RIVER, MISSOURI		
	DESIGN MEMORANDUM NO. 9		
	UPDATED MASTER PLAN		
	PLANS, ELEVATIONS & SECTIONS		
	F (DACW 43)		

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 welcomes and encourages commercial development at Mark Twain Lake and believes the key to future benefits and economic development of the area include addressing the need for lodging and/or resort development.

### **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 when the impacts of unexpectedly high and low lake levels were unknown.

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 does 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 with their docks underwater structural members becoming damaged due to contact with the lake bottom. Both marinas have berthing slips that become unusable or inaccessible due to the shrinking of the 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.

### 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 inundation 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 opportunity to fish from 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 gained for installation of accessible fishing piers in the Spillway Recreation Area. Additional disabled accessible fishing opportunities will be available at a recreational fishing pond within the Frank Russell Recreation Area in the future.

#### 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, hot water heaters and more. Numerous safety issues and complaints have been received in regards to electrical brownouts, thrown breakers and lack of full hookup (water, sewer and electric) sites. The first 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. 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.

#### 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 INADVERTANT 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.

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.

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 is in the investigative stage to determine feasibility.

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. 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. The project offers clerical support, special needs, and location. The special emphasis programs include, but are not limited to the following:

- (a) Boating programs.
- (b) Special hunts for game species 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 will 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, and equestrian-use activities have become very popular on public trails. Statistics show that one-third of the public bicycles, over 50 % use walking trails, and in northeast Missouri a large contingent requires 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 that 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 maintained through numerous volunteers and formal partners. The Missouri Equine Council entered into a Challenge Cost Share 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 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 forestry activities 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 and to MDC for fisheries management only.

Increasingly, competition for the use of these 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 USDA Forest Service, the National Park Service and the Corps 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.

## **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; these 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 NGVD and terminate at 642 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 grisescens*), 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 coincides 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 – Insure a stable population of fish in 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 Uniform State Waterway Marking System and the Manual on Uniform Traffic Control Devices for Streets and Highways (U.S. Department of Transportation, Federal Highway Commission D6.1, 1978). 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 2002.

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.

**TABLE 13-1 Summary of Cost Estimate**

GOVERNMENT ESTIMATE WORKSHEET					Sheet 1 of 2
Project:	<b>Mark Twain Lake Master Plan - Conceptual Cost Estimates</b>			DATE: July 2002	
	<b>Proposed New Facilities</b>				
	DESCRIPTION	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	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%				\$594,450
	<b>SUBTOTAL:</b>				<b>\$4,557,450</b>
	Planning, Engineering, & Design - 15%				\$683,618
	Construction Management - 10%				\$455,745
	<b>CORPS TOTAL PROJECT COST</b>				<b>\$5,696,813</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%				\$155,700
	<b>MDNR TOTAL PROJECT COST</b>				<b>\$1,193,700</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/camp site/hookup	150	0.45	67.5	4	270.00	20	5400
Increased fee collection - \$2.00/camp site/hookup	30	0.4	12	4	48.00	20	960
Total Additional Revenue							6360
<b>Costs</b>							
Increased O&M expenses					100.00		
Initial Construction Cost					5267.32		
Total Costs					5367.32		
<b>Benefit/Cost Ratio</b>					1.18		
<b>South Fork Parking Lot</b>							
<b>Benefits</b>	Days	Occupancy Rate	Total Days Occupied	Daily Increase in Fee	Annual	Number of Additional Parking Spaces	Total Annual Revenue
Increased Parking Revenue	265	0.2	53	2	106.00	30	3180
Increased Parking Revenue	100	0.3	30	2	60.00	30	1800
Total Additional Revenue							4980
<b>Costs</b>							
Increased O&M expenses					100.00		
Initial Construction Cost					3241.43		
Total Costs					3341.43		
<b>Benefit/Cost Ratio</b>					1.49		

**TABLE 13-2 cont'd**

<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 a 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 2013.