

B. EVERETT JORDAN DAM AND LAKE

Master Plan Update **Design Memorandum Number 122**



**Prepared by the
United States Army Corps of Engineers
Wilmington District**

**In coordination with the
State of North Carolina**

FINAL REPORT
APRIL 2010



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
WILMINGTON DISTRICT, CORPS OF ENGINEERS
69 DARLINGTON AVENUE
WILMINGTON, NORTH CAROLINA 28403-1343

CESAW-OP-LS

7 May 2010

MEMORANDUM FOR THE RECORD:

SUBJECT: Approval of the B. Everett Jordan Master Plan Update dated March 2009

1. Reference: ER 1130-2-550 Project Operations, Recreation Operations and Maintenance Policies dated 15 November 1996.
2. The B. Everett Jordan Master Plan Update dated March 2009 Design Memorandum No 122 is approved in accordance with the above reference.
3. If you have any questions please contact Mr. Bill Bond, Park Manager, CESAW-OP-LS at 910-251-4826.

Encl


JEFFERSON M. RYSCAVAGE
Colonel, EN
Commanding

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Preface

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The original *Master Plan (MP) for B. Everett Jordan Dam and Lake* (Design Memorandum 22) was approved in September 1982. Since then, the project and surrounding region have changed significantly from mostly rural to increasingly suburban. In doing so, recreational demand has changed in terms of activities and intensity. In addition, resource management goals and practices have become better defined as the project has evolved.

This update reflects the current status of the project in terms of its physical development; provides an analysis of how well the project functions according to its authorized purposes; and addresses current and evolving issues, requirements, and constraints that affect the future management and development of the project. The purpose of the update is to ensure that the project continues to be developed, operated, and managed in a manner consistent with its authorized purposes, while at the same time, it is responsive to current and foreseeable regional needs and public interests and desires.

After 25 years of operation, we now have the advantage of hindsight to look at patterns of public use, management practices, and resource conditions. This experience and information will help to ensure the MP is responsive to current and foreseeable regional needs, public interests and desires; and that it communicates direction and intent for use of project lands and resources. The resource objectives included in this update further clarify that direction and intent by providing guidance for decision making.

This update is organized into eight chapters, beginning with an introduction that describes the purposes and goals of the Master Plan. Included in this chapter is a description of the project and a table with its vital statistics. The update continues with chapters on natural resources, environmentally sensitive areas, current and future recreational use, public involvement, and coordination with managing agencies. Up to this point, the update inventories and describes existing conditions. The last three chapters outline the results of the planning effort in chapters covering land allocation and classification, resource management objectives, future recreation development, and issues of special concern.

Comments should be directed to the Chief of the Planning and Environmental Branch, U.S. Army Corps of Engineers, Wilmington District, PO Box 1890, Wilmington, North Carolina 28402-1890. Be sure and reference this document.

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Introduction

The Master Plan

Purpose

The Master Plan (MP) for a U.S. Army Corps of Engineers (USACE) reservoir, as prescribed in Engineer Regulation (ER) 1130-2-550 guides development and management of all project lands, surface waters, recreational resources, natural and cultural resources. It sets basic policies that all managing agencies work within for responsible stewardship of project assets. It promotes the protection, conservation and enhancement of all resources. In doing so, the plan must reconcile public desires with resource capabilities and the management policies of the Corps and its managing partners.

As an overall guiding document, the MP deals in concepts, not in the details of facility design or day-to-day operations of the dam and lake. Detailed designs are included in Feature Design Memorandums and contract plans and specifications. Detailed management and administration functions are handled in the Operational Management Plan (OMP), which translates the concepts of the MP into management objectives. Annual work plans translate management objectives into operational elements and tasks.

The Master Plan is a planning document anticipating what could and should occur on project lands and is flexible based upon changing conditions. Although it deals with concepts, the Master Plan addresses specific problems and opportunities associated with the project and develops resource use objectives tailored to initiating management procedures for solving those problems.



A currently approved MP is necessary before new construction, land management practices, or land use changes that may restrict the range of future options can be reviewed and approved. All actions by USACE and its partners must be consistent with the MP. This includes any actions that affect natural and cultural resources or pertain to the development of recreational facilities.



Lake Overlook Area

The original plan for the project, *Design Memorandum 22, Master Plan for B. Everett Jordan Dam and Lake Project*, was published in 1982. This document is the first major update of that initial plan. Changes in policy, management goals, and public demands require evaluation of existing facilities and resources on a recurring basis. By keeping it updated, the MP will continue to be useful as a tool for effective development, management and responsible stewardship of project resources.

Goals

According to Engineering Pamphlet 1130-2-550 the goals of the MP are to prescribe an overall land and water management plan and outline resource use objectives and associated management concepts. These should provide the best possible combination of responses to regional needs, resource capabilities and suitability, and expressed public interests and desires consistent with authorized project purposes.



Northern View from Overlook

The Master Plan should ensure the project contributes to a high degree of recreation diversity within the region; should emphasize the unique qualities, characteristics, and potentials of the project; and should exhibit consistency and compatibility with national objectives and state and regional goals and programs.

Scope

The master planning process focuses on three areas of analysis and consideration:

- ⇒ *Regional and ecosystem needs*
- ⇒ *Resource capabilities and suitability*
- ⇒ *Expressed public interests and desires.*

Within this scope, the MP inventories and analyzes natural, cultural, and man-made resources, and the use, enhancement, and protection of those resources. It also identifies and documents regional development and public interests as they relate to access and use of project resources. In doing this, it also provides a definitive, conceptual guide for development, stewardship, and responsible management of project resources in balance with the needs of the public.

Issues of concern are future recreational development, natural resource conservation and cultural resource protection, collaboration among agencies, protecting and improving water quality, providing environmental education, and guidelines for outgrants.

Benefits

An up-to-date Master Plan provides a well thought out vision of the project's role within its regional context. It also provides an opportunity for reconciling differences between managing partners, where possible, and identifies areas of further discussion when differences cannot be reconciled. It incorporates the public's concerns and desires into the policies of managing agencies.



In-flight View at the Dam

One of the most useful features of the MP and the *master planning process* is that it provides a framework and methodology for gathering, analyzing, and presenting information for future decision-making, planning, and implementation.

Project Authorization

The B. Everett Jordan Dam and Lake was authorized by Congress as a part of the *General Comprehensive Plan for Flood Control and Allied Purposes*, as outlined in the June 28, 1938 Flood Control Act.

Twenty-five years later, Public Law 88-253 authorized construction. Project design and coordination with state and federal agencies began immediately. In 1973, Public Law 93-141 changed the name of the project from "New Hope Reservoir" to "B. Everett Jordan Dam and Lake" in honor of the former senator from North Carolina.



As originally planned, B. Everett Jordan Dam and Lake was to be the first project in a comprehensive water resource development plan for the Cape Fear River Basin. The original plan included the proposed construction of Randleman and Howards Mill Dams on the Deep River and smaller dams on minor tributaries in the headwaters of the basin.

Groundbreaking for the dam took place on December 7, 1970; however, litigation delayed project completion. In 1971, the Conservation Council of North Carolina, et al., filed a water quality lawsuit, seeking to enjoin USACE from further construction of the project. After considerable litigation, the courts issued an injunction stopping construction of the project in 1973, which ultimately delayed completion of the dam until January 1975.

In September 1976, USACE issued a "Notice of Decision to Impound Water." The Conservation Council of North Carolina, et al., objected again. This resulted in a court trial in November 1976. A verdict on the trial was issued in July 1977, sustaining the decision to impound. An appeal by the plaintiffs was denied in January 1979.

During the litigation period, the project functioned as a "dry reservoir", with numerous temporary lake rises during periods of heavy rainfall. Filling of the lake began in September 1981, and normal pool elevation of 216 feet m.s.l. was reached in February 1982.

The lease between the State of North Carolina and USACE was executed on September 1, 1981.

Project Purposes

As described in House Document 508, 87th Congress, the purposes for the B. Everett Jordan Dam and Lake are:

- ⇒ Flood control
- ⇒ Water supply
- ⇒ Water quality control
- ⇒ Recreation
- ⇒ Fish and wildlife conservation

In fulfilling those purposes, land and water areas are planned, developed, and managed to obtain optimum sustained benefits from conservation, enhancement, preservation, and use of natural and developed resources, in accordance with applicable laws and policies established by Congress and the policies and guidelines of USACE and the State of North Carolina.

Project Description

Location

B. Everett Jordan Dam and Lake is located near the geographic center of North Carolina at the eastern edge of a region of rolling hills known as the Piedmont Plateau. The main body of the lake lies almost entirely within Chatham County, with the upper reaches of the project extending into Durham, Orange, and Wake Counties.

The dam impounds the Haw River and its largest tributary, the New Hope River, which joins the Haw 0.3-miles above the dam site. The Haw joins the Deep River 4.2-miles downstream of the dam to form the Cape Fear River.

Although the lower portions of the project remain rural in character, rapidly expanding urban and suburban growth characterize the upper and middle reaches near Raleigh and Cary to the east and Chapel Hill and Durham to the north. Interstate 40 crosses the northernmost reaches of the lake just south of Durham (see Drawings 1 and 2).

Drainage Basin

The Cape Fear River Basin (of which the Haw River Basin is a part) lies wholly within North Carolina, covering 9,140 square miles. It stretches across central North Carolina in a southeasterly direction toward the Atlantic Coast.

The topography of the basin is divided into three major regions: the Piedmont Plateau, the Sandhills, and the Coastal Plain. About one-third of the basin, including the Haw and New Hope Rivers, lies within the Piedmont. This is a region of rolling hills and deeply eroded valleys, ranging in elevation from 150 to 1,000 feet m.s.l.

The Haw River begins at an elevation of approximately 500 feet m.s.l. and falls rapidly to an elevation of about 160 feet m.s.l. where it joins the Deep River at Moncure, N. C. Prior to impoundment, the New Hope River was a slow-moving river with a comparatively wide flood plain and gentle stream gradient. Due to the difference in stream gradients between the Haw and New Hope, most of the project is in the New Hope Basin. The combined Haw and New Hope drainage basin covers 1,690 square miles above the Jordan Dam or 18 percent of the Cape Fear River Basin (see Drawing 3).



Land Acquisition

Land acquisition for B. Everett Jordan began in 1967. The guideline for real estate acquisition was the top elevation of the flood control pool (240 feet m.s.l.), plus a 300-foot horizontal distance or a 5-foot vertical distance above the 240-foot contour; whichever criterion required the greater area. The acquisition line for most of the reservoir area was set at elevation 245 feet m.s.l. In addition to the area within the guide acquisition line, certain additional lands were acquired, based on requirements for

operation, public use, and recreational facilities.

Water Supply

In 1988, USACE and the State of North Carolina finalized a water supply contract allowing the State to use 32.62 percent (or approximately 45,800 acre-feet) of the total conservation storage space between elevations 202 and 216 feet m.s.l. The water supply storage has an estimated safe yield of 100 million gallons per day (mgd). The State then allocated water supply amounts to prospective users.



The cities of Cary and Apex were granted an immediate joint allocation of 12 mgd. Chatham County was granted an immediate allocation of 4 mgd. Future allocations of 2 mgd to Chatham County, 4 mgd to Cary-Apex, 5.5 mgd to Hillsborough, 10 mgd to Orange Water and Sewer Authority (OWASA), 1 mgd to Orange County, and 3.5 mgd to Orange-Alamance Water Systems were also made.

Since the initial allocations in 1988, two additional rounds of allocations have taken place, with some original allocation holders releasing their allocations and other applicants receiving allocations. Allocations fall into two categories. Level I allocations are made based on 20-year water need projections and when withdrawals are planned to begin within five years of receiving the allocation. Level II allocations are made based on longer term needs of up to 30 years.

Exhibit 1. Jordan Water Supply Allocations

Allocation Holder	Level I	Level II	Total
Towns of Cary and Apex	32	0	32
Chatham County	6	0	6
City of Durham	10	0	10
Town of Holly Springs	0	2	2
Town of Morrisville	3.5	0	3.5
Orange County	0	1	1
Orange Water & Sewer Authority	0	5	5
Wake County—RTP South	3.5	0	3.5
Total	55 mgd	8 mgd	63 mgd

Allocations following round three in 2002 are shown in Exhibit 1 (source: NC Div. Of Water Resources). During fiscal year 2003, water supply withdrawals from Jordan Lake totaled 9,396 million gallons for an average of 26 mgd.

Water Storage Pools and Lake Shoreline

At the conservation pool elevation of 216 feet m.s.l., the fetch of the lake at the dam is about 1,000 feet across, increasing to approximately 9,000 feet across at the widest point, about 4.5 miles upstream. The main body of water extends 18 miles up the New Hope River and 5 miles up the Haw River, with approximately 180 miles of shoreline. At normal pool, the lake has a mean depth of 15.4 feet and a maximum depth of about 66 feet. The lake elevation data is plotted in Exhibit 2.

The design of B. Everett Jordan Dam and Lake is based on three basic storage pools (shown in Exhibit 3):

- ⇒ The minimum pool elevation, or **bottom of the conservation pool**, is at elevation 202 feet m.s.l. The minimal level is designated for sedimentation storage. At this level, the surface area of the lake is 6,658 acres, and the impoundment capacity is 74,700 acre-feet of water.
- ⇒ The **top of the conservation pool** is 216 feet m.s.l. This is the normal operating level of the lake unless conditions warrant additional drawdown or impoundment. At the conservation pool, the surface area of the lake is 13,940 acres, and the total impoundment capacity is 215,130 acre-feet. Storage for water supply and water quality is provided within the conservation pool (45,810 acre-feet for water supply and 94,620 acre-feet for water quality).
- ⇒ The **top of the flood control pool** is 240 feet m.s.l. (the elevation of the spillway crest). At this level, the surface area of the lake expands to 31,800 acres, and the water storage capacity increases to 753,560 acre-feet.

Allocation Holder	Level 1	Level 2	Level 3
Town of Cary and Apex	33	0	12
Chatham County	0	0	0
City of Durham	10	0	10
Town of Holly Springs	0	3	3
Town of Morrisville	33	0	33
Orange County	0	1	1
Orange Water & Sewer Authority	0	2	2
Wake County—WTP South	33	0	33
Total	25 mgd	8 mgd	63 mgd

Exhibit 2. Lake Elevations by Months of Year

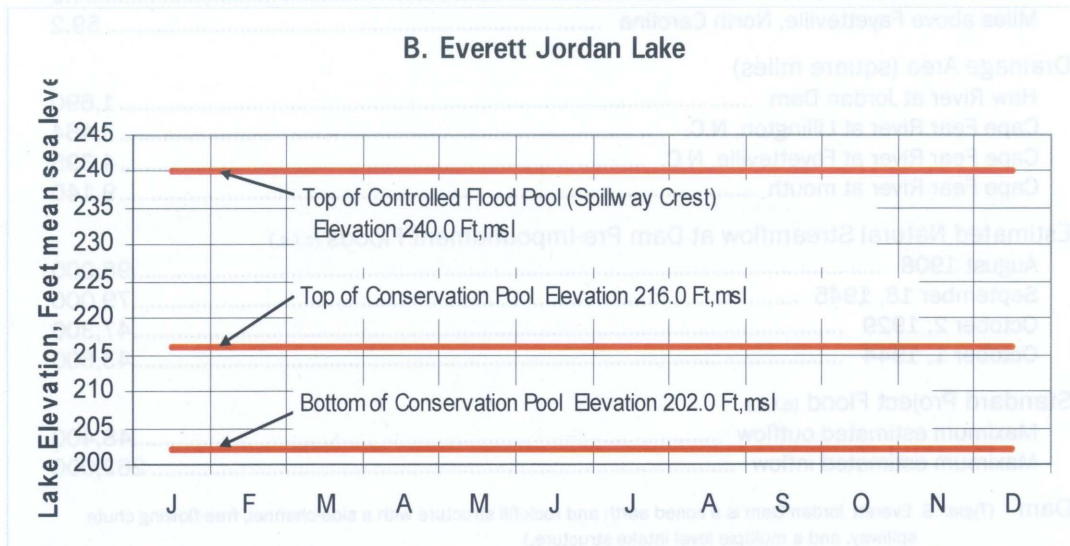


Exhibit 3. Lake Elevations, Acreages, Flood Frequency

	Elevation	Acres	Flood Frequency
Spillway design flood	261.5	51,830	N/A
Standard project flood	246.2	37,130	N/A
Top of flood control pool	240.0	31,800	130 yr.
Other flood levels	242.0	33,480	200 yr.
Other flood levels	238.8	33,480	100 yr.
Other flood levels	235.7	28,180	50 yr.
Other flood levels	229.6	23,390	10 yr.
Other flood levels	227.5	21,790	05 yr.
Normal conservation pool	216.0	13,940	N/A
Minimum conservation pool	202.0	6,660	N/A
Draw down	205.4	8,180	10 yr.
Freeboard allowance	245.0	36,070	N/A
Fee acquisition	N/A	46,049	N/A
Easement	N/A	719	N/A
Total Project Acquisition	N/A	46,768	N/A

Exhibit 4. Project Pertinent Information

Project Location (at Dam)

Miles above mouth of Cape Fear River	202.0
Miles above Lillington, North Carolina	24.2
Miles above mouth of Haw River	4.2
Miles above Fayetteville, North Carolina	59.2

Drainage Area (square miles)

Haw River at Jordan Dam	1,690
Cape Fear River at Lillington, N.C.	3,464
Cape Fear River at Fayetteville, N.C.	4,395
Cape Fear River at mouth	9,140

Estimated Natural Streamflow at Dam Pre-impoundment Floods (c.f.s.)

August 1908	98,000
September 18, 1945	79,000
October 2, 1929	47,300
October 1, 1944	43,600

Standard Project Flood (c.f.s.)

Maximum estimated outflow	48,400
Maximum estimated inflow	262,000

Dam (Type: B. Everett Jordan Dam is a zoned earth and rock-fill structure with a side-channel, free-flowing chute spillway, and a multiple level intake structure.)

Length	1,330 feet
Maximum height	113 feet
Base elevation (mean sea level)	154 feet
Top elevation (mean sea level)	266.5 feet
Spillway elevation (mean sea level)	240.0 feet
Length of spillway crest	800 feet

Lake

Elevations (above mean sea level):

Bottom conservation pool	202.0 feet
Top conservation pool	216.0 feet
Top of flood control pool	240.0 feet
Upper clearing limit	217.0 feet
Guide acquisition line	245.0 feet

(5 feet vertically above top of flood pool or 300 feet horizontally from flood pool, whichever is greater)

Length of lake at elevation 216.0 feet m.s.l., along:

Haw River	5 miles
New Hope River	18 miles
Length of shoreline of lake at 216 feet elevation	200 miles

Acreage

Surface area of lake at bottom of conservation pool (elev. 202.0')	6,660 acres
Surface area of lake at top of conservation pool (elev. 216.0')	13,940 acres
Surface area of lake at top of flood control pool (elev. 240.0')	31,800 acres
Total project acquisition	46,768 acres

Storage Volumes

Bottom of conservation pool (elev. 202.0')	74,700 acre-feet
Top of conservation pool (elev. 216.0')	215,130 acre-feet
Top of flood control pool (elev. 240.0')	753,560 acre-feet

Lake Regulation and Operation

The year-round normal operation level of the lake is 216 feet m.s.l. at the top of the conservation pool. Unless other demands or circumstances dictate, the lake is maintained at this level for water supply and recreational use.

The top of the flood control pool is at elevation 240 feet m.s.l. (the elevation of the spillway crest). Flood storage in the reservoir is used to provide downstream protection during flood events. If floodwaters fill the reservoir above the spillway crest, water flows through the uncontrolled chute spillway.

USACE has calculated downstream flood damages prevented as \$255 million from the beginning of the project's operations in 1981 through 2007.

Generally, releases through the dam are made so that during periods of normal flow, water releases from the reservoir equal the inflow. During flood periods, releases are based on a combination of downstream flow conditions and lake levels to minimize flood damages downstream.

To maintain water quality downstream during periods of normal flow, releases from the reservoir equal inflow. When the combined flow of the Haw and Deep Rivers falls below 600 c.f.s. (cubic feet per second) at Lillington, releases are made from the normal conservation pool (elevation 216 feet m.s.l.), as necessary to maintain the flow at Lillington at 600 c.f.s. The intake tower has the design capacity to mix water from different depths, which is usually done during the spring and fall. During warm months, water is drawn from near the surface, and in the winter water is drawn from near the bottom of the lake.



Exhibit 4 includes additional data on the dam, lake elevations and acreages.

Dam and Dikes

The B. Everett Jordan Dam is a zoned earth and rock-fill structure, 1,330 feet long, with a top elevation of 266.5 feet m.s.l. and a height above the streambed of 113 feet. A paved service roadway is provided across the entire length of the dam. Four saddle dikes were built along the eastern rim of the reservoir to compensate for elevations lower than the spillway design. These dikes are constructed of compacted earthfill with grassed slopes and crests.



Intake Tower



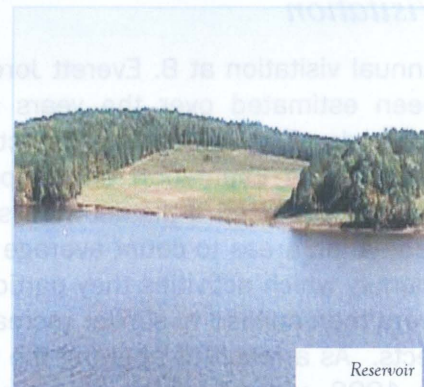
Outlet Works Below Dam

Intake Tower/Outlet Works

The intake tower is a wet well, reinforced concrete structure, located in the lake at the upstream end of the conduit transition, and accessible by bridge from the service road atop the dam. The intake tower contains two service gates, two emergency gates and eight multilevel intakes (all of which are operated to control the passage of water into the transition zone, the conduit, and through the dam). Headwater gauging equipment is located on top of the intake tower. The transition zone is a 57-foot-long concrete structure that provides a gradual change between the gates and the oblong-shaped conduit. The conduit is 360 feet long from the downstream end of the transition zone to the outlet portal. Water flows from the conduit into the stilling basin, and downstream into the tailwater.

Spillway

The emergency uncontrolled chute spillway is utilized in the event the lake level rises above the top of the flood control pool (240 feet m.s.l.). It is located on the left side of the dam (looking downstream). The bottom width is 800 feet and the length is about 1,600 feet. It is oriented so that the floodwaters will flow into the upper reaches of a small tributary that enters the Haw River about 1,000 feet downstream of the base of the dam.



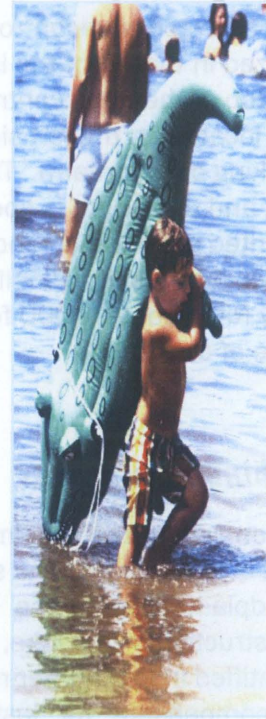
Subimpoundments

Seven "greentree" subimpoundments, totaling 1,550 acres, were constructed as part of the project. The subimpoundments provide partial mitigation for the loss of floodplains due to the impoundment of Jordan Lake. During planning for the construction of the lake, the impacts from the loss of the river and floodplain were identified in lost hunter-man-days. The subimpoundments were identified as a way to compensate for lost hunter-man-days, with a certain amount of acreage providing a certain amount of days of hunting for a certain amount of hunters. USACE built six, and the North Carolina Department of Transportation built one. They are located in tributary areas of the reservoir, above the top of the conservation pool, and below the top of the flood pool. The subimpoundment structures consist of small earthen dams with concrete control structures (with stop-log bays) used to regulate the level and base flow.

The North Carolina Wildlife Resources Commission manages the subimpoundments. Normal operation of the sub-impoundments allows the sites to drain freely for eight months of the year, and then inundates the areas to varying degrees from November through February. The subimpoundments are inundated on a rotational basis and are not all inundated annually. This operational regime is designed to allow the trees and other vegetation to continue growing, while providing waterfowl habitat and food supply as well as hunting opportunities during the dormant winter months. Detailed designs and descriptions are contained in *Design Memorandum 26, Necessity and Plan for Construction of Wildlife Subimpoundments*, May 1984. The locations and areas covered by the subimpoundments are shown on Drawing 4.

Visitation

Annual visitation at B. Everett Jordan Dam and Lake has been estimated over the years using several different methods. The Wilmington District uses a program called "Visitor Use Estimation and Reporting System" (VERS). The District used a district-wide survey at representative recreation areas to count average visitors per vehicle and identify which activities they participate in. These factors were then applied to similar recreation areas at other projects. As a result of applying the survey results obtained in 1998, visitation estimates for all Wilmington District lakes decreased from the period prior to the new survey data. Prior to the new survey, visitation was also estimated through traffic counter data, but estimated visitors per vehicle were not based on actual survey data.



Accordingly, past visitation numbers, prior to 1999, shown in Exhibit 5, are probably skewed to the high side and should be viewed somewhat skeptically. Some of the other abnormal years are attributed to poor weather and conditions associated with two hurricanes in 1996. Hurricane Fran, in early September 1996, caused flooding and wind damage that resulted in temporary closures of facilities and led to lower visitation in both fiscal years 1996 and 1997. A drought and a severe ice storm affected visitation in FY 2001 and 2002.

With the project's location (adjacent to a rapidly expanding urban area) visitation is expected to grow. A more complete discussion of visitation trends in terms of numbers and types of use is contained in the "RECREATIONAL USE ANALYSIS" section of this document (see Chapter 4).

Exhibit 5. Visitation by Year

Fiscal Year	Visitation	Fiscal Year	Visitation
1982	870,000	1995	2,112,940
1983	1,146,328	1996	1,156,557
1984	1,194,100	1997	1,427,700
1985	1,503,081	1998	1,434,800
1986	1,554,534	1999	1,184,700
1987	1,729,628	2000	1,142,963
1988	1,478,396	2001	995,936
1989	1,687,791	2002	974,961
1990	1,744,085	2003	1,098,361
1991	1,554,180	2004	1,184,595
1992	1,656,863	2005	1,206,580
1993	1,894,354	2006	1,143,358
1994	1,914,077	2007	1,285,867

Existing Recreational Development

The Jordan Lake project includes 14 recreational areas that provide a wide range of outdoor recreational activities such as boating, picnicking, camping, hunting, and hiking (see exhibit 6). For a full description of each site, refer to Chapter 4.

Exhibit 6. Recreation Facilities Matrix

FACILITIES → RECREATION AREAS ↓	Public Boat Launching	Boat Docking & Mooring	Boat Rentals	Motor Fuel & Oils	Tent & Trailer Camping	Electric & Water Hookups	Picnic Sites	Group Camping	Swimming Beach	Flush Toilets	Hot Water Showers	Sanitary Dump Station	Parking Area	Trails	Canoe Portage	Camper Use Only	Day Use	Operating Agency
Crosswinds Campground	*				*	*			*	*	*	*	*	*		*		A
White Oak Boat Ramp	*									*			*				*	A
Crosswinds Marina	*	*	*	*						*			*				*	E
Ebenezer Church	*						*		*	*			*	*			*	A
Farrington Point	*												*				*	B
Jordan Lake Edu S.F.							*			*			*	*			*	D
New Hope Overlook	*				*					*			*	*				A
Parkers Creek	*				*	*	*	*	*	*	*	*	*	*				A
Poes Ridge	*					*				*			*	*			*	C
Poplar Point	*				*	*			*	*	*	*	*	*		*		A
Robeson Creek	*												*		*		*	A
Seaforth	*						*		*	*	*		*	*			*	A

- A Operated by NCDPR
- B Operated by NCWRC
- C Operated by USACE
- D Operated by NCDFR
- E Operated by Concessionaire

Regional Influences

Major factors influencing visitation and recreational uses at Jordan Lake are regional demographics and the proximity of competing public recreational resources. Significant changes have occurred in both these areas, since the first days of the project's operations in the early 1980's.

Since 1980, the population of North Carolina has increased from 5,881,766 to approximately 8,049,313 in 2000. The estimated growth rate for the state has been about 1.5 percent per year. During the same 20-year period, population in the immediate Jordan Lake vicinity (Wake, Durham, Orange, and Chatham Counties) has increased from 564,582 to 1,018,716 more than twice as fast as the rest of the state. Not surprisingly, regional land-use development patterns, during this rapid growth, show significant change from rural and agricultural, to suburban and urban. As demographics have changed, the demands for recreational facilities have also changed. Chapter 4 "RECREATION PROGRAM ANALYSIS", includes a more detailed discussion of the subject.

Studies show that typical day-use recreational participants do not travel more than one hour to their destinations. Within about a short travel time of Jordan Lake are a number of competing or supplemental recreational resources, including two other major USACE projects. John H. Kerr Dam and Reservoir, a 119,496-acre project, is located 99 miles north on the Virginia and North Carolina state line. Falls Lake, a 38,576-acre project, is just 45 miles to the northeast of Jordan Lake¹. Falls and Kerr Lakes are multipurpose projects with significant land and water areas and facilities similar to those provided by Jordan.

Together, the three projects provide a wide range of recreational opportunities for residents and visitors to the area. State and local governments also provide significant regional parks and natural areas in the Jordan Lake vicinity, including several parks that provide water-based recreation. Community recreation is also well served in the vicinity by the surrounding municipal and county parks and recreation departments.

Geographic Information System

A variety of geographic data was compiled during the master planning process to create a Geographic Information System (GIS) for Jordan Lake. The data compiled includes information on the area's transportation network, hydrology, vegetation, soils, geology, land uses, as well as other data coverages.

1. Distances are from dam to dam for Kerr and Falls Lake from Jordan Lake. (Portions of each lake are closer together as well as farther apart).

The GIS is intended for use in managing the project and planning for its future development. It is available as a tool to assist decision makers in the agencies involved in the planning and management of Jordan. Graphical representations of much of the data in the GIS are included as sheets in Appendix G.

Additional information that may be of interest are on-line sources such as the Wilmington District's home page www.saw.usace.army.mil and USACE headquarters home page www.usace.army.mil. Navigating these web sites can lead the user to specific information about the project's facilities and current river flows as well as more general information such as the text of the regulations referred to in this plan.

2

Natural Resources Analysis

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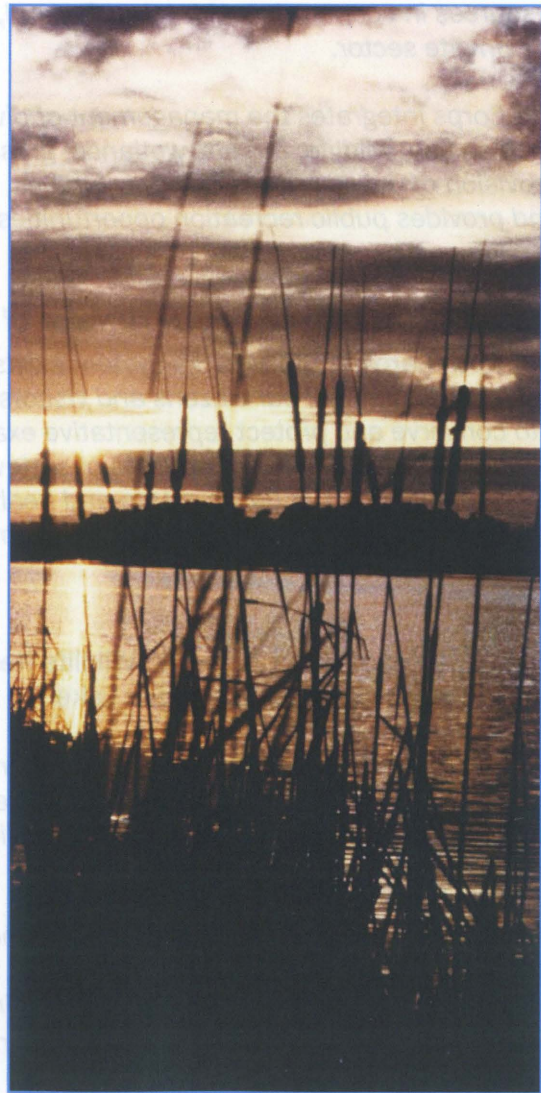
Natural Resources Analysis

2

Introduction

Environmental factors are major considerations in deciding where recreation activities are sited and how intensively an area is developed. Recreation facilities must be designed, constructed and operated in full compliance with PL-91-190, *National Environmental Policy Act* (NEPA), and with other federal statutes and guidelines for environmental protection. Implicit in this policy are six objectives:

- ⇒ To fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- ⇒ To assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
- ⇒ To attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
- ⇒ To preserve important historic, cultural, and natural aspects of our national heritage, and maintain, where possible, an environment which supports diversity and variety of individual choice;
- ⇒ To achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
- ⇒ To enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.



As stated in Engineer Regulation 1130-2-550, Chapter 2, Paragraph 2-2.a.(1), dated November 15, 1996, the Natural Resource Management Mission of the **U.S. Army Corps of Engineers** is as follows:

The Army Corps of Engineers is the steward of the lands and waters at Corps water resources projects. Its Natural Resource 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, forests, wetlands, grasslands, soil, 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.

The mission statement of the **NC Division of Parks and Recreation** follows:

The North Carolina State Parks System exists for the enjoyment, education, health and inspiration of all our citizens and visitors. The mission of the state parks system is to conserve and protect representative examples of the natural beauty, ecological features and recreational resources of statewide significance; to provide outdoor recreational opportunities in a safe and healthy environment; and to provide environmental education opportunities that promote stewardship of the state's natural heritage.

The mission statement of the **NC Wildlife Resources Commission** is stated by division, all of which pertain to Jordan Lake:

Administrative Services provides comprehensive administrative and financial support services for the programs of the Wildlife Resources Commission as well as administering the sale of hunting and fishing licenses and the registration and titling of vessels to the public.

The primary mission of the Division of Engineering Services is to direct, plan and manage all engineering related projects for the North Carolina Wildlife Resources Commission. Additionally, the Division administers the Boating Access Construction and Maintenance and Waterway Marking programs.

The mission of the Division of Wildlife Management is to monitor the health and status of wildlife populations, develop and administer programs for their management and wise use, and when necessary help resolve human-wildlife interactions in a manner which will assure a diverse wildlife resource for future generations of

The Wildlife Resources Commission's Division of Inland Fisheries manages the state's freshwater fisheries through fisheries research, fisheries management, hatchery operation and habitat conservation.

The Enforcement Division is charged with enforcing the rules and regulations es-

The Division of Conservation Education administers and coordinates educational programs designed to facilitate conservation of the state's wildlife and other inter-

The mission of the **NC Division of Forest Resources** is stated below:

Our Mission is to develop, protect, and manage the multiple resources of North Carolina's forests through professional stewardship, enhancing the quality of life for our citizens while ensuring the continuity of these vital resources.

Laws and regulations such as NEPA, agency regulations and mission statements all provide mandates and guidance to management of natural resources. This chapter contains a discussion of the natural resources found at Jordan Lake.



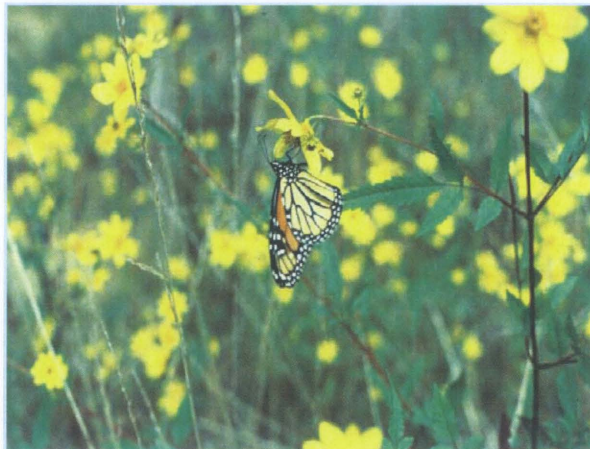
The natural resources at Jordan Lake can be analyzed using the project's integrated Geographic Information System (GIS). This GIS contains the following information which allows for more efficient management of the projects' natural, cultural, and recreational resources. This is not a complete list of data sets available; the GIS is dynamic and requires frequent updates.

- * Aerial photography
- * Cultural resources sites
- * Geological formations
- * Ground water feeds (aquifers)
- * Hazardous Toxic and Radiological Waste site locations
- * Land use/land cover inside and outside the project boundaries
- * Recreation areas
- * Sanitary land fills
- * Soil types
- * State road system
- * Surface water intakes
- * Timber stands
- * United States Geological Survey 7-1/2 -minute quadrangle maps
- * United States Geological Survey hydrologic unit maps
- * Wetlands

Environmental Factors and Available Inventories

Climatological Data¹

The climate of the B. Everett Jordan Dam and Lake area is classified by the National Weather Service as humid-subtropical, with short, mild winters, long, hot, humid summers, and pleasant transitional seasons. The freeze-free season lasts for about 200 days. Monthly temperatures range from a mean temperature of 40 degrees Fahrenheit in January to a mean temperature



¹The source for climate data is the National Climatic Data Center, U.S. Dept. of Commerce, Raleigh-Durham Airport.

of 79 degrees in July. Normal temperatures in January range between a low of 30 degrees and a high of 50 degrees. Normal July temperatures range between lows of 69 degrees and highs of 89 degrees; however, highs in excess of 90 degrees are not uncommon. Extreme temperatures recorded range from a low of -9 degrees to a high of 105 degrees.

The average annual precipitation in the area is 43 inches per year. Rainfall is fairly evenly distributed throughout the year. The month with the highest average precipitation is July, averaging 4.3 inches, and the driest month is April, averaging 2.8 inches.

Prevailing winds are generally from the southwest during most of the year, but are from the northeast during the months of August, September, and October and average about 8 miles per hour. There have been destructive local windstorms, some developing into tornadoes, with winds of 100 miles per hour or more.

Winds of such high velocity are rare and, in most cases, associated with hurricanes or other tropical storms. Though rare in the region, hurricanes have been known to generate very heavy rainfall and rainfall accumulations, significant local and regional flood damage, major loss of timber and forest resources through wind-thrown trees, damage to and loss of use of recreation facilities due to extended high water and even loss of life.

The climatic conditions are well suited for outdoor recreation during the majority of the year. The most intensive outdoor recreation use occurs from May through October with the months of May, June, July and August representing the heart of the recreation season.

Vegetation

Several studies of vegetative resources were conducted during the pre-impoundment planning process and after impoundment (see Drawing 5 and Exhibit 7). These include the following:

- ⇒ *The Impact of Intermittent Flooding on Forest Vegetation* by Moore and Qualls (1975) was a survey of the effect of periodic inundation on project floods. This study was included in the Supplement to the Final Environmental Impact Statement for the project. A following study continued observations of intermittent flooding on forests, with a section on survival rates of plantings of selected flood tolerant species at four sites subjected to different frequencies of inundation.
- ⇒ *B. Everett Jordan Dam & Lake Assessment of the Vegetation* by Moore and Wood (1976) was a comprehensive vegetation survey which included floristic and vegetative analysis of all project lands above the top of the conservation pool (216 feet m.s.l.).
- ⇒ *Jordan Lake Natural Areas* by Roe and Moore, North Carolina Natural Heritage Program (1986) identified seven natural areas totaling 1675 acres on project lands.

- ⇒ AAA Engineering and Drafting, Inc. conducted a forest inventory (1989) for all project lands and produced Forest Cover Type maps. This inventory data includes detailed information on forest stands (stand type, size, class, density, etc.)
- ⇒ *B. Everett Jordan Lake Project: Inventory for Rare, Threatened, and Endangered Species and Natural Community Inventory* by LeGrand (1999) identified 21 significant natural areas totaling 4,043 acres.

Vegetation and water significantly influence the recreation experience. While mature stands of vegetation are beneficial to most outdoor recreational uses, specific types of vegetation can influence the type of activity planned for an area. Generally, camping and picnicking are located in wooded areas, while open areas are suitable for playing fields, beaches and parking areas.



The absence of tree cover, in areas otherwise desirable for camping or picnicking, could add to the cost of providing landscape planting, and several years are required for the planted trees to grow to an effective size. Certain types of vegetation, including pines and upland hardwoods, tolerant recreational development. Bottomland hardwoods and wetlands are more sensitive, although sensitive areas are found in all vegetation types.

Exhibit 7. Vegetation Types (as shown on Drawing 5)		
Land Use Number	Vegetation Type	Description
7	Low Density Vegetation	Areas that have some vegetative cover but are not forested. Fallow fields, cleared areas in early successional stages, and some landscaped residential areas are included in this class. Wide utility corridors (power and communication), some narrow road systems and weed covered spoil piles along drainage ditches also occur in this category.
8	Pine Forest	Medium and high-density conifer stands, predominantly loblolly pine.
9	Bottomland Hardwoods	Hardwood stands found predominantly in the floodplains of streams and rivers. These stands are dominated by deciduous species such as lowland species of maple, black gum, oak, sweet gum, sycamore, birch, elm, and ash.
10	Hardwood	Hardwood stands found predominantly in upland areas, on gently sloping interstream divides or in drier low lying areas. Stands dominated by oak, hickory, elm, and maple.
11	Pine/Hardwood	Stands of mixed conifer and deciduous hardwood. Neither pine nor hardwood comprises greater than 75% of the crown density.

Wildlife

Inventories of wildlife resources at Jordan Lake also exist. Annual Waterfowl Impoundment Hunter and Harvest Surveys have been conducted by NCWRC since 1989. Annual survey data is also collected by NCWRC on largemouth bass and crappie fisheries. Numerous theses and published articles on various fisheries topics at Jordan Lake have originated at North Carolina State University and are available from the library there. One other notable study was James Frasier's study of bald eagle usage on Falls and Jordan Lakes (1989). An interagency team used Frasier's results, other data gathered at Falls and Jordan Lakes, and public input to compile the *Eagle Management Plan for Falls and Jordan Lakes*.

Eagle nesting and management areas are considered environmentally sensitive areas of Jordan Lake. To prevent unnecessary disturbance to the species, information on eagle nesting is designated "Approved Use Only" for USACE, U.S. Fish and Wildlife Service (USFWS) and the other managing agencies. This information is not for release in any form to other agencies or the public. Other information on eagles, such as general biology, management activities and nesting success is encouraged to be used in outreach presentations. No other federally-

listed, threatened or endangered animal species are known to exist on project lands at Jordan, although listed plant species exist on project lands, and listed animal species occur in the project vicinity and downstream of the Jordan Dam.

The project area has a diversity of wildlife habitat and supports populations of numerous wildlife species to varying degrees. Deer are abundant and well distributed throughout the project lands. Furbearers, such as beaver, raccoon, muskrat, and opossum are also abundant. Upland species include squirrel, rabbit, quail, turkey, mourning doves, foxes, and songbirds. Several species of waterfowl, such as mallards, black ducks and wood ducks, utilize the area. Typical Piedmont nongame species of birds, mammals, fish, reptiles, amphibians, and invertebrates also are found.



Consumptive recreational uses, such as hunting, and nonconsumptive recreational uses, such as wildlife viewing and bird watching, are popular at Jordan Lake.

Wetlands

Wetlands are areas that are covered by water or have waterlogged soils for long periods during the growing season. Plants growing in wetlands are capable of living in saturated soil conditions for at least part of the growing season. Wetlands such as swamps and marshes are often obvious, but some wetlands are not easily recognized.

Some of these wetland types include, but are not limited to, many bottomland forests, pine savannahs, wet meadows, and potholes.

Section 404 of the Clean Water Act requires that anyone interested in depositing dredged or fill material into "waters of the United States, including wetlands," must receive authorization for such activities. USACE has been assigned responsibility for administering the Section 404 permitting process. Activities in wetlands for which permits may be required include, but are not limited to:

- ⇒ Placement of fill material.
- ⇒ Ditching activities when the excavated material is sidecast.
- ⇒ Levee and dike construction.
- ⇒ Mechanized land clearing.
- ⇒ Land leveling.
- ⇒ Most road construction.
- ⇒ Dam construction.

Requests to use public lands are directed initially to the Operations Manager, and are coordinated with the various managing partners and stakeholders. That coordination involves review and input by the Raleigh Regulatory Field Office whenever there is a likelihood that wetlands might be involved. The final determination of whether project lands are wetlands and/or whether the activity requires a permit will be made by the Wilmington District USACE.

A general depiction of the wetland areas at Jordan Lake can be found in Appendix G., Drawing six, the National Wetlands Inventory. The information shown on this drawing is based on National Wetland inventory data. Prior to undertaking any activity which may impact wetlands an onsite survey is required.

Water

Hydrology data may be obtained through querying the GIS. Studies of water quality at Jordan Lake have been undertaken by the NC Division of Water Quality, and by municipalities that use the lake for water supply.

Soils

The soils data for Jordan Lake was received from the Natural Resources Conservation Service (NRCS) and the North Carolina Center Geographic Information and Analysis for the four counties of Chatham, Durham, Orange, and Wake (see Drawing 7). Detailed soils information can be obtained through querying the GIS. The following section contains a discussion of the suitability of soils for recreation and supporting wildlife habitat.

The soils of the Jordan area are rated by NRCS criteria in Exhibit 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, texture of the surface layer, and susceptibility to flooding. Soils subject to flooding are limited for recreational use by the duration, intensity and season of the flooding; therefore, on-site assessment is essential. The ability of the soil to support vegetation is also important, as is its capability to support septic systems, if that type of waste disposal is planned.

In Exhibit 8, the degree of soil limitation is expressed by NRCS as "Slight", "Moderate," or "Severe". "Slight" means that soil properties are generally favorable and limitations are minor and easily overcome. "Moderate" means that limitations can be overcome or alleviated by planning, design, or special maintenance. "Severe" means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

This information indicates the dominant soil condition but does not eliminate the need for on-site investigation. The following categories contain NRCS general recommendations for different types of recreational development based solely on soil characteristics and slopes:



- ⇒ **Camp Areas** require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and heavily used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.



- ⇒ **Picnic Areas** are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry and are not subject to flooding during the period of use. Furthermore, they do not have slopes, stones, or boulders that increase the cost of shaping sites or of building access roads and parking areas.

- ⇒ **Paths and Trails** should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and few or no stones or boulders on the surface.



- ⇒ **Playgrounds** require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or hardpan should be considered.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. The kind and abundance of wildlife largely depend on the amount and distribution of food, cover, and water. In Exhibit 8, the soils in the project area are rated according to their potential for providing habitat for various kinds of wildlife.

The potential of the soil is rated "good", "fair", "poor" or "very poor". A rating of "good" indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of "fair" indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of "poor" indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of "very poor" indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.



Exhibit 8. Soil Limitations For Recreational Development

Soil Series	Paths and Trails	Camp Area	Picnic Areas	Playgrounds
Altavista	Moderate: Wetness	Severe: Flooding	Moderate: Wetness	Moderate: Slope, Wetness
Augusta	Severe: Flooding	Severe: Flooding	Severe: Flooding	Severe: Flooding
Badin	Slight	Slight	Slight	Moderate: Slope
Carbonton	Slight	Moderate: Slope	Moderate: Slope	Moderate: Slope
Cartecay	Moderate: Wetness	Severe: Flooding, Wetness	Moderate: Flooding, Wetness	Severe: Flooding, Wetness
Cecil	Slight	Slight	Slight	Moderate: Slope, Small Stones
Chewacla	Severe: Wetness	Severe: Flooding, Wetness	Severe: Wetness	Severe: Flooding, Wetness
Cid	Moderate: Wetness	Moderate: Wetness	Moderate: Wetness	Moderate: Wetness
Congaree	Moderate: Flooding	Severe: Flooding	Moderate: Flooding	Severe: Flooding
Creedmoor	Moderate: Wetness	Severe: Percs Slowly	Severe: Percs Slowly	Severe: Slope, Percs Slowly
Faceville	Slight	Slight	Slight	Slight
Georgeville	Severe: Erodes Easily	Slight	Slight	Moderate: Slope
Goldston	Moderate: Slope	Severe: Slope, Depth to Rock	Severe: Slope, Depth to Rock	Severe: Slope, Depth to Rock, Small Stones
Granville	Slight	Slight	Slight	Moderate: Slope
Helena	Moderate: Wetness	Moderate: Wetness, Percs Slowly	Moderate: Wetness, Percs Slowly	Moderate: Slope, Wetness, Percs Slowly
Herndon	Severe: Erodes Easily	Slight	Slight	Moderate: Slope
Iredell	Moderate: Wetness	Severe: Wetness	Moderate: Slope, Wetness	Severe: Slope, Wetness

Exhibit 8. Cont. Soil Limitations For Recreational Development

Soil Series	Paths and Trails	Camp Areas	Picnic Areas	Playgrounds
Masada	Slight	Slight	Slight	Moderate: Slope
Mayodan	Slight	Slight	Slight	Moderate: Slope
Nason	Severe: Erodes Easily	Moderate: Slope	Moderate: Slope	Severe: Slope
Peawick	Severe: Flooding	Severe: Flooding, Percs Slowly	Severe: Flooding, Percs Slowly	Severe: Flooding, Percs Slowly
Pinkston	Slight	Slight	Slight	Severe: Slope
Riverview	Severe: Flooding	Severe: Flooding	Severe: Flooding	Severe: Flooding
Roanoke	Severe: Wetness	Severe: Flooding, Wetness, Percs Slowly	Severe: Wetness, Percs Slowly	Severe: Flooding, Wetness, Percs Slowly
State	Slight	Slight	Slight	Slight
Wahee	Severe: Wetness	Severe: Flooding, Wetness	Severe: Wetness	Severe: Wetness
Wedowee	Slight	Moderate: Slope	Moderate: Slope	Severe: Slope
Wehadkee	Severe: Wetness	Severe: Wetness, Flooding	Severe: Wetness	Severe: Wetness, Flooding
White Store	Moderate: Wetness	Severe: Wetness, Percs Slowly	Severe: Wetness, Percs Slowly	Severe: Wetness, Percs slowly, Slope
Wickham	Slight	Severe: Flooding	Slight	Moderate: Slope
Wikes	Moderate: Slope	Severe: Slope, Depth to Rock	Severe: Slope, Depth to Rock	Severe: Slope, Depth to Rock
Worsham	Severe: Wetness	Severe: Wetness, Percs Slowly, Flooding	Severe: Wetness, Percs Slowly	Severe: Flooding, Wetness
Zion	Moderate: Slope	Moderate: Slope, Percs Slowly	Moderate: Slope, Percs Slowly	Moderate: Slope, Percs Slowly

Exhibit 9. Soil Suitability for Wildlife Habitat

Soil Series	Grain and Seed	Grasses and Legumes	Wild Herbaceous Plants	Hardwood Trees	Coniferous Trees	Wetland Plants	Shallow Water Areas	Open land Wildlife	Woodland Wildlife	Wetland Wildlife
Altavista	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Badin	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor
Carbonton	Poor	Poor	Poor	Fair	Fair	Poor	Poor	Poor	Fair	Poor
Cartecay	Poor	Fair	Fair	Good	Good	Poor	Very Poor	Fair	Good	Very Poor
Cecil	Good	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Chewacla	Very Poor	Poor	Poor	Good	Good	Fair	Fair	Poor	Fair	Fair
Cid	Fair	Fair	Fair	Good	Good	Very Poor	Very Poor	Fair	Good	Very Poor
Congaree	Poor	Fair	Fair	Good	Good	Poor	Very Poor	Fair	Good	Very Poor
Creedmoor	Fair	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor
Faceville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Georgeville	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair
Goldston	Poor	Fair	Good	Fair	Fair	Very Poor	Very Poor	Fair	Fair	Very Poor
Granville	Good	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Helena	Fair	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Herndon	Good	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Iredel	Fair	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor
Masada	Good	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor
Mayodan	Fair	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Nason	Fair	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor
Peawick	Fair	Fair	Fair	Good	Good	Very Poor	Very Poor	Fair	Good	Very Poor
Pinkston	Poor	Poor	Poor	Poor	Poor	Very Poor	Very Poor	Poor	Poor	Very Poor
Riverview	Fair	Fair	Good	Good	Good	Good	Good	Fair	Good	Good
Roanoke	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good
State	Good	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Wahee	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair
Wedowee	Fair	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor
Wehadkee	Very Poor	Poor	Poor	Fair	Fair	Good	Fair	Poor	Fair	Fair
White Store	Fair	Good	Good	Fair	Fair	Very Poor	Very Poor	Good	Fair	Very Poor
Wickham	Fair	Good	Good	Good	Good	Poor	Very Poor	Good	Good	Very Poor
Wilkes	Poor	Poor	Fair	Fair	Fair	Very Poor	Very Poor	Poor	Fair	Very Poor
Warshaw	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good
Zion	Good	Good	Good	Good	Good	Very Poor	Very Poor	Good	Good	Very Poor

Slope

The slope data for the greater Jordan area was established from the Natural Resources Conservation Service's (NRCS) soil information. The topography of the area ranges from gently rolling to very steep slopes along the west bank of the project. The steep slopes are found primarily in the Haw River area, while the northern portions associated with the New Hope River Basin are very flat. The eastern banks are gently rolling and ideal for development from the standpoint of general topography. Suitability for future development in terms of slope can be determined by querying the database on slope breakout. For purposes of this study, the following slope separations are used:

- ⇒ Flat = 0 - 2%
- ⇒ Gentle = 3 - 6%
- ⇒ Moderate = 7 - 15%
- ⇒ Steep = 16 - 25%
- ⇒ Very Steep = 26 +%

Development should be limited in flat areas due to poor drainage and flooding susceptibility. Areas with gentle to moderate slopes are generally best suited for intensive recreational usage and are the most common categories found at Jordan, particularly along the slopes of the east banks. Areas classified as steep are expensive to develop and maintain and are generally recommended only for low-intensity uses such as trails and overlooks. However, these areas may be utilized in limited ways for more intensive use. Very steep areas are not recommended for developed recreational uses due to expense and adverse environmental consequences. However, certain nature trails and scenic overlooks may be located along these areas with careful planning and construction. Drawing 8 shows a general slope analysis of the Jordan lands.

Geology

The B. Everett Jordan Lake project lies within the Piedmont Physiographic Province, an uplifted peneplain in various stages of dissection, having a generally southeasterly slope ranging from 1,000 feet m.s.l. in the west to 300 feet m.s.l. where the Piedmont meets the Coastal Plain. The project lies near the western margin of the Durham Triassic Basin, which was formed by a downfaulting of relatively recent age sedimentary formations into the much older igneous formations, both of which were then subjected to erosion. This fault generally runs north-south along the western portion of the project (see Drawing 9).

The majority of the project is situated within the Durham Triassic Basin, with only a few small portions extending into the older crystalline igneous rock. The lake area is underlain predominantly by Upper Triassic Age formations of reddish-brown conglomerates and red to purple sandstone. These rock formations are fractured by many joints, faults, and diabase dikes. The portions of the lake, which extend out of the Triassic Basin, are underlain by rock of the Carolina Slate Belt Series, Pre-Cambrian or Lower Paleozoic Period. These rocks, ranging in color from dark grayish-black to a light blue or green, are a series of slates, schists, and gneiss originating from metamorphosed sedimentary and igneous rocks, including meta-basalts, meta-dacits, meta-felsites, and volcanic breccias and flows. These rocks are predominantly rough and hard and are cut by numerous quartz veins and diabase dikes.

The volcanic-triassic interface (Western Border Fault) has created two distinct geographic zones. The area west of the fault is characterized by steep slopes and soils formed from igneous rock. As these old rock formations eroded, rock was deposited near the point of faulting and in eroded valleys perpendicular to the fault. This fault created a natural channel for the formation of a river that deposited alluvial soils to the east over the downshifted sedimentary rock. The downshift of sedimentary rock formed a gently rising gradient from the fault to the east. Because of this gentle slope, the land has been utilized for agriculture more so than land west of the fault. This sedimentary rock formation underlies the majority of the project.

Other geologic factors to be noted are the diabase dikes. These formations are minor faults that were filled with impervious igneous material. These dikes act as dams to impede groundwater flow and are good locations for wells.

Surrounding Land Use

Adjacent land uses deserve attention in planning recreational development and natural resources management because of their potential impacts on the project, both beneficial and detrimental. Population growth, urbanization and sprawl impact public lands, recreation uses, natural resources and many other programs. Most residential areas surrounding the project are associated with the cities of Durham, Chapel Hill, Pittsboro, Apex, and Cary. Several rural communities are also scattered around the project's periphery. Residential and associated development (schools, etc.) adjacent to public lands often lead to concerns about buffers and safety zones. Development pressures bring associated demands for infrastructure support (roads, power lines, gas lines, cell towers, sewer, water). These demands and concerns should lead land managers and planning and zoning officials into closer coordination regarding surrounding land use and existing or proposed uses of public lands.

Population concentrations can influence use trends and affect the location of new recreational facilities. Some industrial uses are located upstream of the project, primarily in the Chapel Hill-Durham area. The potential exists for contamination of the lake from industrial waste, as well as other potential impacts (visual, audible and odiferous) from industrial developments. Agricultural land used for active farms and pastures is scattered throughout the areas adjoining the project. Agricultural run-off (containing soil, fertilizer and other nutrients) can negatively affect the project's water quality and provide conditions for undesirable growth of aquatic vegetation. Forested land accounts for some of the surrounding area, although forested areas are increasingly fragmented in size and ownership.

Land uses for the area around B. Everett Jordan Dam and Lake were inventoried from the Land Use/Land Cover coverages computerized for the *Albemarle-Pamlico Estuarine Study* (see Drawing 10 and Exhibit 10). *Land uses which occur include the following:*

- ⇒ Water
- ⇒ Low Density Developed
- ⇒ Medium Density Developed
- ⇒ High Density Developed
- ⇒ Agriculture
- ⇒ Disturbed Land
- ⇒ Forested Areas.

Exhibit 10. Land Use Types (as shown in Drawing 10)

Land Use Number	Land Use Type		Description
2	Water		Lakes, reservoirs, ponds. Also includes streams or rivers wide enough to be resolved by the Thematic Mapper.
3-5	Low, Medium, & High Density Developed		Residential, commercial and industrial complexes. The three categories correspond roughly to areas where structures and/or pavement cover 25% to 50%, 50% to 85%, and >85%, respectively, of the ground areas classified.
6	Agriculture		Cropland and pasture, bare and grass covered soils. Includes all land cleared for agricultural or silvicultural activities. Wide transportation corridors (such as interstate highways with grassy medians), beach grasses, golf courses, large athletic fields and other grassy features are also in this class.
12	Disturbed Land		Bare fields that have undergone recent disturbance; predominantly agricultural fields and clear cuts but also includes some developed areas such as sites being prepared for construction or around quarries.
21	Forested	Pine Forest	Medium and high-density conifer stands, predominantly loblolly pine.
		Bottomland Hardwoods	Hardwood stands found predominantly in the floodplains of streams and rivers. These stands are dominated by deciduous species such as lowland species of maple, black gum, oak, sweet gum, sycamore, birch, elm, and ash.
		Hardwood	Hardwood stands found predominantly in upland areas on gently sloping interstream divides or in drier low-lying areas. Stands dominated by oak, hickory, elm, and maple.
		Pine/Hardwood	Stands of mixed conifer and deciduous hardwood. Neither pine nor hardwood comprises greater than 75% of the crown density.

3

Environmentally Sensitive Areas

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Environmentally Sensitive Areas

3

Environmentally Sensitive Areas

Introduction

USACE and State of North Carolina managing agencies are required to identify and manage special scientific, ecological, cultural, and aesthetic resources. The overall goal of this effort is to protect sensitive features from overuse or destruction. Finding these features is an ongoing process that includes periodic review of the project, through in-house and contracted studies. The latest study undertaken involved natural heritage sites and was conducted in 1999 by the Natural Heritage Program (NHP) staff of the NC Division of Parks and Recreation (NCDPR) under contract with USACE. In addition to the environmentally sensitive areas, additional areas of potential environmental concern have been identified.

Environmentally sensitive areas can be adversely impacted and damaged by a variety of threats, including neglect. Like all natural resources, they require careful and appropriate management that begins with an awareness of their existence, an understanding of the critical components of the resource (what it needs to thrive), the immediate and long term threats to its survival, an action plan (what must be done, when and by whom), and lastly, willing and committed stewards to execute the plan. While some sensitive areas may need simple protection, others may need disturbance or other active management to thrive. Management recommendations and plans for the sites will be jointly developed by USACE, the Natural Heritage Program and the responsible managing agency.



Natural Heritage Areas

Natural Heritage Areas are designated by the NCDENR's Natural Heritage Program as representative examples of the state's natural diversity, and include areas of biological, botanical, zoological, and ecological resources of state and regional significance. At Jordan Lake, these areas are designated and recognized under a Memorandum of Understanding (MOU) between the State of North Carolina and USACE.

The Jordan Lake project contains seven registered natural areas. USACE owns the land fee simple on all but one of the seven areas. The Big Oak Woods tract is located on land owned by the University of North Carolina, with a flowage easement owned by USACE. Six areas (see Exhibit 10) are managed by the State of North Carolina and one (Poe's Ridge) is managed by USACE. During the designation process, the Natural Heritage Program and USACE developed individual area descriptions and management recommendations for each site. The NC Natural Heritage Program (contracted by USACE) completed a re-evaluation Of the Natural Heritage Areas and a new survey of project lands in 1999. Results of the survey include additional areas that may warrant designation and/or the Development of new management recommendations for existing and new Natural Heritage Areas. Natural Heritage Program and USACE are developing an Amendment to the original MOU that designated natural areas for registry with the Natural Heritage Program. Areas listed in Exhibit 11 reflect Natural Heritage Areas proposed for listing in the Amended MOU.

Exhibit 10.a Jordan Lake Natural Heritage Areas (on Fee-Owned Land)

Site Name	Significance	Acres	Managing Agency
New Hope Bottomland Forest	Mature bottomland forest; exemplary natural communities; rare plant species	693	NCWRC
Big Woods – Old Quarry Creek	Representative mesic and upland hardwood forest; diverse herbaceous flora; rare plant species; State Educational Forest	72	NCDPR
Robeson Creek	Representative river slope hardwood forest	128	NCWRC
Windfall Branch	Mature upland forest	69	NCDPR
Weaver Creek	Mature loblolly pine and mixed pine/hardwood forest; rare plant species	566	NCWRC
Poe's Ridge	Cross-section of hardwood forest types; rare plant species	87	USACE

Proposed Additional Natural Heritage Areas

The NC Natural Heritage Program (contracted by USACE) completed a re-evaluation of the Natural Heritage Areas and a new survey of project lands in 1999. Results of the survey include additional areas that may warrant designation and/or the development of new management recommendations for existing and new Natural Heritage Areas. Natural Heritage Program and USACE have a draft amendment to the original MOU that designated natural areas for registry with the Natural Heritage Program. Areas listed in Exhibit 10.b reflect proposed additions to the Natural Heritage Areas listed in the original MOU.

Exhibit 10.b Proposed Additional Jordan Lake Natural Heritage Areas (on Fee-Owned Land)

Site Name	Significance	Acres	Managing Agency
White Oak Creek Floodplain	Good example of floodplain pool; Good quality hardwood forest (Piedmont/Low Mountain Alluvial Forest); Unusual plant combination on eastern ridges, including rare species.	170	NCWRC
Panther Creek Diabase Dike	Uncommon diabase dike geomorphic feature; associated Abasic@ forests (Basic Mesic and Basic Oak-Hickory Forest natural communities)	32	NCWRC
Northeast Creek (NeC) Diabase Dike	One of the longest expanses of intact forest over a diabase dike in NC=s eastern Piedmont (nearly one mile); good-high quality Basic Oak-Hickory Forest	28	Mostly Private/ NCWRC
NeC Floodplain B Below Grandale Drive	Large extent of Mesic Mixed Hardwood Forest, Floodplain variant; Two Significantly Rare plant species	245	NCWRC
NeC Floodplain B Above Grandale Drive	Good to excellent examples of Piedmont/Mountain Swamp Forest and Piedmont/Mountain Bottomland Hardwood Forest (Former quite rare in NC); Two rare plant species	260	NCWRC/ USACE
New Hope Creek (NHC) Floodplain B Jordan Lake to Stagecoach Rd	One of the most mature canopies of Piedmont/Mountain Bottomland Forest B A sizable remnant of a relatively rare natural community*	460	NCWRC
NHC Floodplain B Jordan Lake to Stagecoach Rd Seep	Rare or uncommon natural communities in the Piedmont—Basic Mesic Forest, Low Elevation Seep, and Mesic Mixed Hardwood Forest, Floodplain variant	40	NCWRC
NHC Floodplain Jordan Lake to Stagecoach Rd To I-40	High quality, mature Piedmont/Mountain Bottomland Forest; Four reported locally rare plant species*	535	NCWRC
NHC Floodplain B I-40 to NC 54	High quality, mature examples of floodplain natural communities*	320	NCWRC
Morgan Creek Swamp B Jordan Lake to Farrington Mill Rd	Mature floodplain forest and example of Basic Oak-Hickory Forest; Rare plant species	440	NCWRC

Exhibit 10.b (Continued) Proposed Additional Jordan Lake Natural Heritage Areas
(on Fee-Owned Land)

Site Name	Significance	Acres	Managing Agency
Morgan Creek Slopes B North of Farrington Mill Road	Good example of Basic Oak-Hickory Forest; Outcroppings of a diabase dike; Rare Plant Species	50	NCWRC
Big Woods Road Upland Forests	Three sections: one with a rare natural community (Xeric Hardpan Forest) and good habitat diversity; middle section contains mature forest as well as species uncommon for Jordan Lake; third section previously registered	175	NCDFR
Parkers Creek Ridges	Mature hardwood forest on the ridges, including Dry Oak-Hickory Forest and Basic Oak-Hickory Forest natural communities	127	NCWRC & NCDFR
Robeson Creek Depression and Hardpan	Contains only known example of Upland Depression Swamp Forest in Jordan Lake area, surrounded by mature hardwood forests. Presence of mafic and hardpan soils in upland forest	33	NCDPR
Gum Springs Church Road Slopes	Considerable extent of mature upland hardwood forests; presence of locally rare plants	285	NCWRC
Robeson Creek Slopes	Abundant wildflowers in understory, including locally rare to uncommon plants	128	NCWRC

*Artificial flooding is likely to negatively impact this site's herb layer.

Natural Heritage Element Occurrence Sites

The Natural Heritage Element Occurrence Sites include the locations of rare and endangered species populations, occurrences of exemplary or unique natural ecosystems (terrestrial and palustrine), and special wildlife habitats. This information is used during project planning and design to ensure protection of these areas. Sensitive resource information is shared among managing agencies, but is restricted to protect the sites and not made available for general release.

Cultural Resources - Historical, Archaeological

Investigations to locate historic and prehistoric properties within the impoundment and development areas were initiated in 1963. Individuals, universities, consulting firms, and staff archaeologists of USACE, Wilmington District, conducted these investigations. All investigations were funded directly by the Wilmington District or through the transfer of funds to the Secretary of the Interior.

In 1964, Gerald Patrick Smith, then a graduate student working for the Research Laboratories of Anthropology at the University of North Carolina, Chapel Hill, conducted an archaeological survey of the proposed B. Everett Jordan Lake area. This survey resulted in two reports. The first report (COE 1965) addressed the cultural resources management issues related to the proposed project, listed the sites found, provided a brief description for each site, and made recommendations for further work.

The second report (Smith 1965) was prepared as a Master's thesis and provided interpretive and theoretical models for the materials found. During the course of this survey, Smith located 142 new sites and revisited 34 previously known sites. The bulk of the material proved to be late Archaic (Stanly, Morrow Mountain, Guilford, Halifax, and Savannah River), with small amounts of Early Archaic (Hardaway, Palmer, and Kirk), and Woodland artifacts (Badin, New Hope, Yadkin, Uwharrie and Carraway) (Smith 1965:150).

In 1976, archaeological studies were undertaken of two road relocations necessitated by the construction of B. Everett Jordan Lake. The investigation along the proposed right-of-way for SR 1715 located two historical structures, three pre-historical sites, and two insignificant surface scatters. None of these sites were considered significant and no further work was recommended. No sites were found during the survey of the SR 1008 right-of-way.

In the summer of 1978, archaeologists from Commonwealth Associates, Inc. undertook an archaeological and historical sites survey of the Parkers Creek (then called Chatham County) (656 acres), Poplar Point (580 acres) Recreation Areas, and a survey of the boat ramps and access roads at the Crosswinds Recreation Area (approximately 20 acres).



Excavation of the Haw River Site Complex

Also in 1978, the Wilmington District Corps of Engineers began planning for the Ebenezer Church Recreation Area. In 1979, archaeologists from Soil Systems Inc. investigated this area. The purposes of this investigation were to identify archaeological and historical sites, to document the Ebenezer Log Church (a property listed on the National Register of Historic Places), and to collect oral histories on the historical settlement of the area.

In 1982, the Wilmington District awarded a contract to Commonwealth Associates, Inc. to perform an archaeological and historical survey of approximately 4,000 acres of B. Everett Jordan Lake that were to be developed as recreation areas or wildlife subimpoundments. The results of the archaeological survey resulted in the discovery of 94 archaeological sites, dating from the Paleo-Indian through the Late Historical periods.

As a result of these surveys, several properties are now listed on the National Register of Historic Places. These include the Haw River Site complex, the Newkirk Site, the John A. Mason House, the New Hope Rural Historic Archaeological District, the Little Creek Archaeological Site, and the Wilderness Island (Lasater) Homestead.

Pre-history

The pre-history of the region can be divided into four general time or cultural periods: Paleo-Indian, Archaic, Early Woodland, and Late Woodland. Paleo-Indian sites indicate the presence of nomadic hunters with limited tools. During the Woodland period, the practice of horticulture began, although the native people continued to rely heavily on hunting and gathering for sustenance.

John Lawson, the explorer of the Piedmont region of the Carolinas, wrote the earliest published account of European contact in the Haw River Valley in 1701. The area remained largely unsettled until the mid-1700s, when pioneer farmsteads were established in the region. The area has undergone a remarkable succession of changes in its cultural landscape since that time.

Bottomlands began to be cleared during the Revolutionary era. Uplands were occupied and a transportation network was established by 1810, ushering in an era of mixed commercial agriculture in which the largest landholders used slave labor to raise corn, hogs and wheat. Tenant farmers began to grow more cash crop tobacco after the Civil War. Tobacco, cotton and other crops grown without rotation were detrimental to the land's fertility. Poverty prompted rural exodus until the Depression, when electrification and soil conservation practices allowed intensive agricultural management of fewer farms with fewer acres in cultivation. Rapid growth of nearby urban areas continues to shape the landscape today.

Management and Protection of Cultural Resources

Strategies for management and protection of significant archaeological and historical sites at Jordan are covered in the project's *Historic Properties Management Plan* (Design Memorandum 30, September 1984). The management plan implements Sections 106 and 110 of the National Historic Preservation Act. Project activities are also affected by the Native American Graves Protection and Repatriation Act and the Archaeological Resource Protection Act. In addition to managing known sites, all areas that have not been surveyed are evaluated for cultural resources prior to initiating development or management activities that are considered ground-disturbing activities, such as site development work and timbering operations.

Artifacts collected and removed from Jordan Lake were curated and locations of those collections are recorded by the USACE district archaeologist. Locations of archaeological sites, including recommendations for further study, have been recorded in the Jordan Lake GIS. Like Natural Heritage Element Occurrence sites, this information is used during project planning and design to ensure protection of these areas. Sensitive site information is shared among managing agencies, but is restricted to protect the sites and not made available for general release.

4

Recreation Program Analysis

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Recreation Program Analysis

Recreation Program Analysis

Introduction

One of the purposes of the Master Plan (MP) is to develop a long-term recreation plan for Jordan Lake. The plan must meet several criteria. First of all, it must comply with the authorized purposes of the project. It must also address public desires, while protecting the natural and cultural resources. Finally, it must meet the general policies of USACE and the State of North Carolina managing agencies.

This chapter inventories existing recreation visitation and facilities and forecasts future demand for additional facilities. In doing so, it includes summaries of each developed recreation area. Drawings of each area are in Appendix G. It also includes an analysis of regional recreation demand, and discusses expressed public desires for additional recreational opportunities.

Existing Recreation Areas

Of the 19 recreation sites described in the original Master Plan for Jordan Lake, 12 sites have been developed. The annual visitation (FY 07) for each of the developed sites at which visitation data is collected is listed in Exhibit 11. In addition, there are three designated bank fishing areas: one at the Tailrace area within Poe's Ridge Recreation Area and two others independent of a developed recreation area (see Drawing 4, Recreation and Exhibit 12). Descriptions of the 12 developed sites are included in this chapter.

Existing developed recreation areas occupy about 5600 acres at Jordan Lake. That accounts for just eighteen percent of the 31,000 acres of land at Jordan and twelve percent of the total land and water. The extensive land and water areas *not* in developed recreation areas are also used for recreation, including a full range of dispersed recreation such as hunting, fishing, hiking, bird watching, etc. Data for visitation on undeveloped lands is difficult to gather—traffic counters do not capture visitors parking along roadsides or walking in from adjacent lands, but USACE estimates visitation for these dispersed users through factors based on observed patterns of use. Visitation that does not cross a traffic counter accounts for many of our visitors, in fact in FY 2006 it was estimated to account for seventeen percent of total visitation. For a more complete discussion of both dispersed and developed recreation activities, see Chapter 7.

Visitation

Exhibit 11. Developed Recreation Sites	Number of Visitors *
Poe's Ridge	153,321
Ebenezer Church	178,801
Farrington Point	96,654
Crosswinds Campground	36,790
Crosswinds Marina	64,513
Crosswinds Boat Ramp	5,380
Vista Point	33,843
Parkers Creek	56,425
Jordan Lake Educational State Forest	40,597
Seaforth	179,221
Poplar Point	63,710
New Hope Overlook	42,449
Robeson Creek	53,600

* Visitation data is number of visitors during Fiscal Year 2006

B. EVERETT JORDAN MASTER PLAN UPDATE

Exhibit 12
Master Facility

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Canoe Portage	Boat Beach	Courtesy Docks	Fishing Pier/Platform	Boat Rentals	Motor Fuel & Oil	Boat Docking and Mooring	Campsite w/Elec & Water	Campsite w/o Elec & Water	Walk-in Campsites	Group Campsites	Picnic Shelter (12 tables)	Picnic Shelter (8 tables)	Picnic Shelter (4 tables)	Picnic Shelter (2 tables)	Picnic Sites (individual)	Swim Beach	Playground	Multi Use Game Court	Trails Hiking	Comfort Stations	Comfort Stations w/showers	Comfort Stations w/ dressing room	Composting Toilet	Dump Station	Car Parking Spaces	Car Trailer Parking Spaces	24-Hour operation	Ranger Residence	Day Use Facilities Only
Recreation Areas																																			
Poe's Ridge	COE	579	13	1	4			1	1												6		1		x	2			1	50	83	X		X	
Ebenezer Church	DFR	213	213	2	6			2									1		2		73	1	1		X	2		1		381	155			X	
Farrington Point	WRC	88	7	2	6																										141	X			
Crosswinds Campground	DPR	582	582**	1*	2			1					173	69								1*	1		X	1	3		1	56	28				
White Oak Boat Ramp	DPR			1	6			1																		1					124		1	X	
Crosswinds Marina	CON			1	4					X	X	320																		150	50			X	
Vista Point	DPR	626	147	1	4		1	1					504			5		1			6	1*			X	1	1		1	80	300				
Parker's Creek	DPR	803	521	1*	2	X							123	121		6	1	2		1	21	1	2	2	X	3	6	1	1	111	18		1		
Jordan Lake Edu State Forest	DPR	1050	22															1							X					10				X	
Seaforth	DPR	228	228	1	6			1									1				40	1	1	1	X	1		1		360	165			X	
Poplar Point	DPR	504	504	1*	4			1					372	208								1*	1		X	6	8		2	80	74		1		
New Hope Overlook	DPR	826	445	1	4			3							25										X	1		2			203				
Robeson Cr	DPR	410	31	1	2	X		1																						45	120	X		X	
TOTALS		5903	2713	14	50		1	12	1			320	1172	398	25	11	3	4	2	1	146	6	7	3		18	18	3	3	5	1323	1461		3	

Poe's Ridge

Poe's Ridge is a 579-acre site that includes USACE administrative headquarters, the project dam and spillway, with frontage both on the lake and the Haw River downstream of the dam. Public access is by Secondary Roads (SR) 1931 and 1970, approximately 2-1/4 miles northwest of Moncure, NC, at U.S. Highway 1. The site is managed by USACE. The Visitor Assistance Center provides lake, natural



resource and recreation information, and is an Environmental Education Center for visitors and regional schools. Approximately 13 acres have been intensively developed for two separate day-use areas. One area is a public boat-launching facility on 10 acres, and the second is a 3-acre bank-fishing area on the west bank of the Tailrace area (see Exhibit 12a). The Tailrace has associated picnic and restroom

facilities (see Site Drawing 16 in Appendix G.). The remaining 566 acres are managed as project operations and multiple resource lands.

Exhibit 12a. Poe's Ridge

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Fishing Pier / Platform	Picnic Sites (individual)	Playground	Hiking Trails	Comfort Stations	Composting Toilet	Car Parking Spaces	Car - Trailer Parking Spaces	24 Hour Operations	Day Use Facilities Only
Poe's Ridge	USACE	579	13	1	4	1	1	6	1	X	2	1	50	83	X	X



Ebenezer Church

Ebenezer Church is a 213-acre day-use area operated by the North Carolina Division of Parks and Recreation (NCDPR). Its location in the southeast part of the lake is accessed via U.S. Highway 64 to the north and SR 1008 to the east. Facilities include picnic areas, a swim beach, and boat ramps. The area is popular with wind surfers. The entire site has been intensively developed (see Exhibit 12b below and Site Drawing 17 in Appendix G.).



Exhibit 12b. Ebenezer Church

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Picnic Shelter (12 table)	Picnic Shelter (4 table)	Picnic Sites (individual)	Swim Beach	Playground	Trails - Hiking	Comfort Stations	Comfort Station w/dressing room	Car Parking Spaces	Car - Trailer Parking Spaces	Day - Use Facilities Only
Ebenezer Church	DPR	213	213	2	6	2	1	2	73	1	1	X	2	1	381	155	X

Farrington Point

Farrington Point is an 88-acre day-use area with two boat ramps and parking areas, operated by the North Carolina Wildlife Resources Commission (NCWRC). It is located in the northwest part of the lake, adjacent to SR 1008. Currently, seven acres are intensively developed, with the remaining 81



acres managed as multiple resource lands (see Exhibit 12c below and Site Drawing 18 in Appendix G.).

Exhibit 12c. Farrington Point

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Car - Trailer Parking Spaces	24 - Hour Operations	Day - Use Facilities
Farrington Point	WRC	88	7	2	6	141	X	

Crosswinds

The Crosswinds sites are located in the central portion of the lake on the eastern shore, at the intersection of SR 1008 and U.S. Highway 64. The entire 582-acre site has been intensively developed, with the exception of 17 acres just north of U.S. Hwy. 64, which is outgranted for the Cary/Apex water intake station.



Crosswinds consists of three recreational areas: Crosswinds Campground, White Oak Boat Ramp, and Crosswinds Marina (see Exhibit 12d). The campground, also managed by NCDPR, offers campsites with and without hook-ups and a campers-only swim beach and boat ramp. The marina, operated by a concessionaire, offers both wet and dry boat slips, boat rentals and service area, fuel, and grocery sales (see Crosswinds Site Drawings 19 and 20 in Appendix G.). The approximately 85 acre NCDPR headquarters for Jordan Lake State Recreation Area is located opposite Crosswinds on the south side of U.S. Hwy. 64.

Exhibit 12d. Crosswinds

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Boat Rentals	Motor Fuel & Oil	Boat Docking & Mooring	Campsite w/Elec & Water	Campsites w/o Elec & Water	Swim Beach	Playground	Trails-Hiking	Comfort Stations	Comfort Stations w/showers	Dump Stations	Car Parking Spaces	Car Trailer Parking Spaces	Ranger Residence	Day - Use Facilities Only
Crosswinds Camp-ground	DPR	582	582	1	2	1				173	69	1	1	X	1	3	1	56	28		
Crosswinds Marina	CON			1	4		X	X	320									156	50		X
White Oak Boat Ramp	DPR			1	6	1									1				124	1	X

* Camper Use Only



Vista Point

Vista Point is a 626-acre site, operated by NCDPR, with 147 acres intensively developed (see Exhibit 12e below and Drawing 21 in Appendix G.). The remaining 479 acres are classified as multiple resource lands. Located on the southwest shore of the lake, it is three miles south of U.S. Hwy 64, with access via SR 1700. The site offers day-use picnicking, boat ramp facilities and camping facilities. The camping facilities are designed for large groups and RV campers in groups. A swim beach is provided for camper-only use, and a sailing beach is also provided.

Exhibit 12e. Vista Point

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Boat Beach	Courtesy Docks	Campsite with Elec & Water	Group Campsites	Picnic Shelter (8 table)	Picnic sites (individual)	Swim Beach	Trails - Hiking	Comfort Stations	Comfort Station w/showers	Dump Stations	Car Parking Spaces	Car - Trailer Parking Spaces
Vista Point	DPR	626	147	1	4	1	1	50#	5	1	6	1*	X	1	1	1	80	100

* Camper Use Only

Group RV Use Only

Parkers Creek

Parkers Creek is an 803-acre site, managed by NCDPR, centrally located on the western shore of the lake at U.S. Hwy 64. On this site, 521 acres are intensively developed, with the remaining 282 acres classified as multiple resource lands. Facilities at this area include picnic areas and shelters, a swim beach, a boat ramp for campers, group campsites, and campsites with and without water and electric hook-ups (see Exhibit 12f). The swim beach is located on a small sub-impoundment, which is also available for canoeing (see Parkers Creek Site Drawings 22 and 23 in Appendix G.).



Exhibit 12f. Parkers Creek

FACILITIES																				
	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Canoe Portage	Campsite E/Elec & Water	Campsites w/o Elec & Water	Group Campsites	Picnic Shelter (12 table)	Picnic Shelter (8 table)	Picnic Shelter (2 table)	Picnic Sites (individual)	Swim Beach	Playground	Multi-Use Game Court	Trails - Hiking	Comfort Stations	Comfort Stations w/showers	Comfort Stations w/dressing
Parkers Creek	DPR	803	521	1*	2	X	123	121	6	1	2	1	21	1	2	2	X	3	6	1
																			1	1
																			111	18
																				1

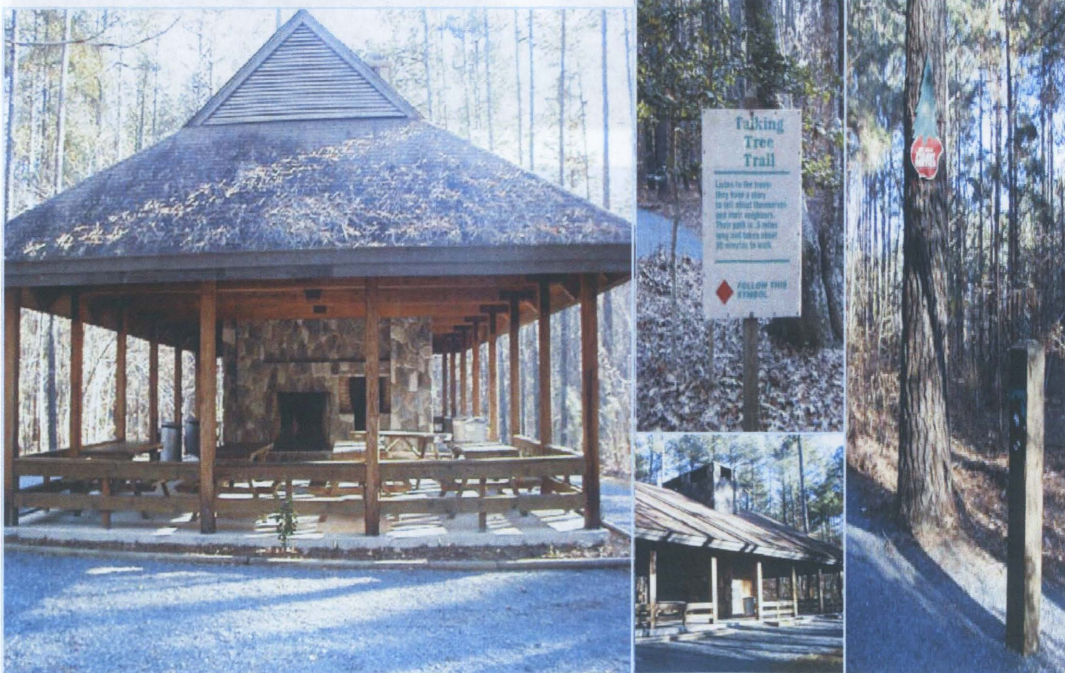
* Camper Use Only

Jordan Lake Educational State Forest

Jordan Lake Educational State Forest is located just north of the Parkers Creek site, along SR 1715. The NC Division of Forest Resources (NCDNR) manages this day-use area. Within this 1,050-acre site, 22 acres have been intensively developed (see Exhibit 12g below and Site Drawing 24 in Appendix G.). The remaining acreage (1,028 acres) is managed as multiple resources land. Development at the site includes an environmental education center offering displays and interpretive programming, demonstration forest, picnic facilities and trails.

Exhibit 12g. Jordan Lake Educational State Forest

FACILITIES	Operating Agency	Total Acres	Developed Acres	Picnic Shelter (8 table)	Trails - Hiking	Car Parking Spaces	Day Use Facilities Only
Jordan Lake Educational State Forest	DFR	1050	22	1	X	10	X



Seaforth

Seaforth is located at the end of the same peninsula as Parkers Creek and is bordered by U.S. Highway 64 to the north. Its mid-lake location is perhaps the best of the project. This 228-acre day-use area is managed by NCDPR and entirely and intensively developed for recreation (see Site Drawing 25 in Appendix G.). Development includes a boat ramp, playground, sand volleyball court, picnic, swimming, restroom and shower facilities (see Exhibit 12h).



Exhibit 12h. Seaforth

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Picnic Shelter (12 Table)	Picnic Sites (individual)	Swim Beach	Playground	Multi - Use Game Court	Trails - Hiking	Comfort Stations	Comfort station w/dressing room	Car Parking Spaces	Car - Trailer Parking Spaces	Day Use Facilities Only
Seaforth	DPR	228	228	1	6	1	1	40	1	1	1	X	1	1	380	165	X

Poplar Point

Poplar Point is located south of U.S. Highway 64 on the southeast shore of the lake and accessed via SR 1008. This 504-acre site is entirely developed for camping and managed by the NCDPR. It is the largest campground at Jordan Lake. Development includes campsites with and without hook-ups, a boat ramp



and swim beach for campers use only, nature trails, and sanitary facilities (see Exhibit 12i below and Poplar Point Site Drawings 26 and 27 in Appendix G.).

Exhibit 12i. Poplar Point

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Campside w/Ele & Water	Campsites w/o Elec & Water	Swim Beach	Playground	Trails - Hiking	Comfort Stations	Comfort Stations w/showers	Dump Stations	Car Parking Spaces	Car - Trailer Parking Spaces	Ranger Residence
Poplar Point	DPR	504	504	1*	4	1	372	208	1*	1	X	6	8	2	80	74	1

* Camper Use Only

New Hope Overlook

New Hope Overlook is located in the southeast part of the project not far from the Jordan Lake Visitor Assistance Center (USACE office). Access is via U.S. Highway 1 and State Routes 1700 and 1910. This 826-acre site, managed by the NCDPR, contains 445 acres that have been intensively developed (see Exhibit 12j below and Site Drawing 28 in Appendix G.). Development includes a boat ramp and a walk-in campground with composting toilets.



Exhibit 12j. New Hope Overlook

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Courtesy Docks	Walk – in Campsites	Trails – Hiking	Comfort Stations	Composting Toilet	Car – Trailer Parking Spaces
New Hope Overlook	DPR	826	445	1	4	3	25	X	1	2	203

Robeson Creek

Robeson Creek is located in the southwest part of the project and is the sole developed recreational area on the Haw River section of Jordan, upstream of its confluence with New Hope Creek. Access to this site is via SR 1943 from U.S. Hwy 64. The 410-acre day-use site, managed by NCDPR, contains 31 acres that have been intensively developed (see Exhibit 12k below and Site Drawing 29 in Appendix G.). Development includes a boat ramp and canoe access area.



Exhibit 12k. Robeson Creek

FACILITIES	Operating Agency	Total Acres	Developed Acres	Boat Ramps	Boat Launch Lanes	Canoe Portage	Courtesy Docks	Car Parking Spaces	Car Trailer Parking Spaces	24- Hour Operations	Day Use Facilities Only
Robeson Creek	DPR	410	31	1	2	X	1	45	120	X	X

Recreation Demand

This section explains the methods used to analyze and project future visitation. It includes a section on current recreation use and finishes with a section on public recreation desires in terms of types of activities. Estimating future visitation is a multi-step process which involves defining the project market area, compiling the existing and future population of that area, and applying current per capita use rates to future population projections. In this way, projections can be made about future visitation.

Total visitation is only part of the equation; in addition, an assessment of visitor recreational activities demands is also needed to establish recreation goals and priorities for the future. Three methods were used to establish the public preferences. First, a summary of existing use shows what types of facilities are in demand and how heavily they are used. Secondly, the results were examined from periodic surveys of the general public regarding their recreation preferences (surveys conducted by the NC Division of Parks and Recreation). Finally, letters were sent to individuals and groups who have expressed an interest in Jordan Lake, soliciting their input.

Together, the visitation projections and activity analysis provide a general view of future development in terms of quantity and types of facilities.

Visitation Projections

Past studies indicate that a number of factors influence visitation to recreation facilities. Income, education, and employment rates are among the most important; a higher rate in each correlates to a corresponding rise in recreation participation. However, by far the most important factors are proximity and population. This study discusses all five factors but concentrates mainly on the latter two.

Market Area

In terms of recreation demand, the market area is the geographic area where the great majority of potential and actual project visitors live. By defining that area, future visitation can be projected from current visitation levels. Projecting future visitation from current levels only gives an indication of demand—availability of facilities also plays a large role. Problems may arise with making the assumption that future visitors will engage in the same pursuits that past visitors did. This kind of projection must be balanced with trend information on demographics and preferences to get a clearer picture of future visitation.

Competing Facilities

At the heart of this assessment is an understanding that Jordan Lake competes for visitors primarily with other water-oriented recreational facilities. The lakes within 100 miles of Jordan Lake that provide water-based recreation facilities are presented in Exhibit 13.

Exhibit 13. Competing Facilities		
Facility	Owner/Agency	Water Surface Acres
Blewett Falls Lake	Municipal/Industrial	2,560
Lake Tillery	Municipal/Industrial	5,260
Badin Lake	Municipal/Industrial	5,353
Tuckertown Lake	Municipal/Industrial	2,560
High Rock Lake	Municipal/Industrial	15,750
Hycos Lake	Municipal/Industrial	3,750
Harris Lake	Municipal/Industrial	4,100
John H. Kerr Reservoir	Corps of Engineers	48,900
Falls Lake	Corps of Engineers	12,490

Area of Influence

Traditionally, a 50-mile radius around a reservoir describes its Area of Influence. A USACE survey of more than 2,000 recreational visitors to Jordan Lake in 1995-96 (in which zip code data was collected) revealed that almost 90% lived within this 50-mile radius. The 2000 USACE study of boating recreation on Jordan Lake revealed that nearby Harris Lake was the most commonly used alternative lake, used by nearly thirty percent of Jordan ramp users. John H. Kerr and Falls Lakes were also used by approximately twenty percent of Jordan ramp users.

The Jordan 50-mile radius was delineated on a map and compared to the Areas of Influence associated with the competing projects listed in Exhibit 13. The projects were each assigned a twenty-five-mile, forty-mile or fifty-mile radius based on their relative size and supply of recreation facilities. The southern portion of the market area (i.e. the Fayetteville area) is influenced by the proximity of the Cape Fear River and the Atlantic Coast as competing areas for water-oriented outdoor recreation.

The original Master Plan considered the proposed Randleman and Howards Mill projects in the market area analysis. However, Howards Mill was not constructed. Randleman Lake has been constructed by the Piedmont Triad Regional Water Authority, but does not have recreation facilities and thus is not considered a competing facility in this analysis.

The elimination of these projects expands the Jordan market area into the Alamance County area. The counties that lie entirely within the 50-mile radius of Jordan Lake are considered for analysis purposes to represent the market area. Exhibit 14 depicts Jordan Lake and competing projects' areas of influence. Exhibit 15 presents population data for the market area.

Exhibit 14. Competing Areas of Influence

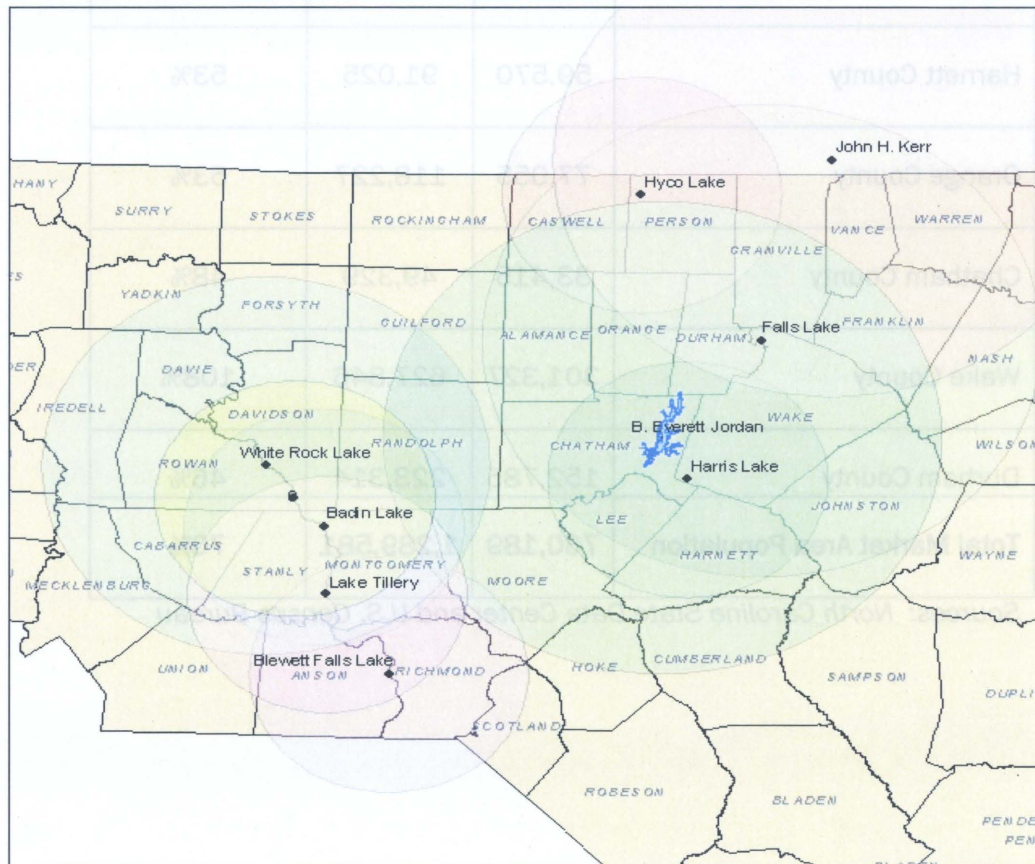


Exhibit 15. B. Everett Jordan Market Area Population 1980 and 2000
Population by County

Location	1980	2000	% Change
Alamance County	99,319	130,800	32%
Lee County	36,718	49,040	34%
Harnett County	59,570	91,025	53%
Orange County	77,055	118,227	53%
Chatham County	33,415	49,329	48%
Wake County	301,327	627,846	108%
Durham County	152,785	223,314	46%
Total Market Area Population	760,189	1,289,581	70%

Sources: North Carolina State Data Center and U.S. Census Bureau

Socioeconomic Characteristics

Exhibit 16 "Socioeconomic Characteristics" presents selected socioeconomic data for the counties whose parts comprise the market area. In this analysis, population and place of residence are the primary factors considered in evaluating the recreational attraction of Jordan Lake; however, other demographic information also helps understand future demand. As previously stated, high levels of education, income, and employment indicate a strong recreational market.

Exhibit 16. Socioeconomic Characteristics – Education 2000		
Location	% Population who are HS graduates	% Population with College Education (Bachelor's or higher)
North Carolina	78.1	22.5
Alamance	76.5	19.2
Lee	76.3	17.2
Harnett	75.0	12.8
Orange	87.6	51.5
Chatham	77.9	27.6
Wake	89.3	43.9
Durham	83.0	40.1

16a. Socioeconomic Characteristics Income in 1999	
Location	Per Capita Income
North Carolina	26,419
Alamance	19,391
Lee	25,740
Harnett	19,705
Orange	29,500
Chatham	30,046
Wake	35,759
Durham	29,677
<i>Note: Data for 1999.</i> <i>Source: U.S. Bureau of Economics Analysis</i> <i>Regional Economic Measurement Division</i>	

Exhibit 16b. Socioeconomic Characteristics – Unemployment 2000							
% Wake	% Durham	% Chatham	% Lee	% Harnett	% Orange	% Alamance	% N. C.
2.4	2.9	2.5	4.8	6.7	1.7	3.4	5.0

Note: Data for 2000: Source: North Carolina Employment Security Commission

Market Forecast

Several generalizations can be made about the market area's population and demographics. The region's combination of economic vitality, educational opportunity, mild climate and general quality of life have resulted in the metropolitan area of Raleigh/Durham/Chapel Hill being named "The Best Place to Live in the South" by *Money* magazine and "The Best City for Education" in the *Places Rated Almanac* in 2000, among other accolades.

Obviously, the area has experienced robust population growth over the previous two decades. In-migration from other regions of the country has been the chief source of population growth for most of the region, a trend that is expected to continue. Rapid population growth is expected to continue, although maybe not as rapid as the growth that has occurred between 1980 and 2000.

Part of the region's attraction is a diverse economic base with service, government, manufacturing, and trade comprising significant sectors of employment. Manufacturing in the region has undergone a shift towards high-tech industries from traditional textile and tobacco product manufacturing. Overall unemployment is very low. The area's economic success is reflected in income levels, which average significantly higher than the median for the state in most locations.

The market area is also relatively young, racially diverse, and well educated. Major contributors to these characteristics are three major research and teaching universities (University of North Carolina at Chapel Hill, North Carolina State University, and Duke University), several historically black colleges and universities and other institutions of higher learning.

Area transportation systems determine how easily visitors can get to the project and play a significant role in how the project is used. Jordan is served by Interstate 40, U.S. 1 and U.S. 15-501, making the recreational facilities within easy access of the regional population. The major routes serving the project area are shown on Drawing 2, Project Vicinity.

Access from the west is by U.S. 64 from Asheboro and I-40 from Greensboro. U.S. 1 and U.S. 15-501 provide access from the Sanford area to the south. The Fayetteville area has access by way of NC 87, U.S. 421, U.S. 401, and NC 55. The Raleigh area visitors use U.S. 1 and U.S. 64. U.S. 15-501, NC 54, NC 55 and I-40 serve the Durham-Chapel Hill area.

This regional access network is supplemented by state and local roads that provide easy access and circulation throughout the project. This well-developed access

system helps disperse traffic loads and reduces the impact of visitation on any one facility.

Market Area Summary

Jordan Lake is located in one of the most rapidly developing regions of the country. Regional demographics indicate rapid growth in demand for recreational opportunities. Increased demand will be placed on Jordan Lake's recreation facilities and natural resources.

Recreational Use Analysis

Per Capita Use Rates

The original MP for Jordan Lake estimated recreational visitation demand by developing per capita use rates from data in the 1973 North Carolina Comprehensive Outdoor Recreational Plan, Tech II, and from estimated visitation recorded at a similar USACE project. The per capita use rates estimated the percentage of the population that would visit the project and participate in various activities like camping, fishing, boating, etc. The rates were applied to the market area population to estimate visitation.

This plan uses visitation data compiled from over 20 years of operation of Jordan Lake. In estimating visitation through the use of traffic counters over the years, USACE has used different factors to estimate number of visitors per car, time spent per visit, activities engaged in during visit, etc. Through this method, monthly and annual visitation records have been compiled. The current factors, in use since 1999 and based on an actual survey, indicate lower load factors (number of people per car) than those previously used. The subsequent per capita use rates can be used to evaluate existing recreational facility visitation and to project future visitation rates. The per capita use rate is developed from the following formula:

- ⇒ Population data for the Jordan Lake market area, comparing 1980 to 2000, presented in Exhibit 15, illustrates that the market area is experiencing a substantial growth in population.
- ⇒ The year 2000 was selected as the basis to compute the per capita use rate for the lake, because Bureau of Census data is available. Therefore, the 2000 visitation of 1,113,601 divided by the 2000 market area population of 1,289,581, yields a per capita use rate of 0.86.

⇒ The market area population was projected to the year 2020 using population projections produced by the State of North Carolina, Office of State Planning, for the counties within the market area. Exhibit 18 displays projected population for the years 2010 and 2020 for the market area.

$$\begin{aligned} & \text{Total Annual Visitation} / \text{divided by Market Area Population} \\ & = \text{Per Capita Use Rate} \end{aligned}$$

Visitation data for Jordan Lake is kept on a monthly and fiscal year basis for each recreational area by activity type. A fiscal year (federal) begins October 1 and ends September 30 of the next year. Therefore, fiscal year 1990 (FY90) starts October 1, 1989 and ends September 30, 1990. Fiscal year visitation for Jordan Lake is shown below in Exhibit 17.

Exhibit 17. Fiscal Year Visitation

Fiscal Year	Visitation
1982	870,000
1983	1,146,328
1984	1,194,100
1985	1,503,081
1986	1,554,534
1987	1,729,628
1988	1,478,396
1989	1,687,791
1990	1,744,085
1991	1,554,183
1992	1,656,863
1993	1,833,399
1994	1,999,351
1995	2,112,940
1996	1,156,557
1997	1,427,700
1998	1,434,800
1999	1,184,700
2000	1,142,963
2001	995,936
2002	974,961
2003	1,098,361
2004	1,184,595
2005	1,206,580
2006	1,143,358
2007	1,285,867

Sources: . U.S. Army Engineer District, Wilmington, North Carolina, Jordan Lake.

Exhibit 18. Projected Population		
County	2010	2020
Alamance	148,781	171,023
Lee	53,433	59,648
Harnett	112,964	137,638
Orange	131,515	149,080
Chatham	61,987	73,924
Wake	859,649	1,106,218
Durham	260,010	297,461
Total	1,628,339	1,994,992

Sources: : North Carolina State Data Center, last updated June 2005

Projected Visitation

Applying per capita use rates to visitation projections assumes per capita use rates will remain constant over the years. To accept this assumption, one must accept that other recreational facilities in the area will continue to be developed and utilized as they are at the present time, and that the public's recreational preferences will remain constant over the time period being projected. In other words, projected visitation figures should be viewed with some skepticism.

However, all indications are that the market area population will continue to grow, and it is logical to assume that the population will continue to seek outdoor recreational opportunities. We should expect visitation to continue to increase at Jordan as the area's population increases. The types of recreation that visitors will demand at Jordan in the future are largely a function of preferences that tend to change over the years, the demographics of the region, and the provision of other recreational opportunities in the region. Projected visitation was developed by applying the current per capita use rate to the projected population values for the market area. The total projected visitation for Jordan Lake is shown in Exhibit 19.

Exhibit 19. Projected Visitation			
Year	Market Area Population	Per Capita Use Rate	Projected Visitation
2010	1,628,339	0.86	1,400,371
2020	1,994,992	0.86	1,715,693

Participation Rates

Participation rates for the various recreational activities at B. Everett Jordan were calculated using the 1990 visitation data collected at the lake. The sum of the rates (Total Rate) is greater than 1.0 because visitors often participate in more than one activity and are counted more than once. Exhibit 20 presents activity participation rates associated with visitation data collected in 1990 and the estimated rates developed in the 1982 Jordan Master Plan. Note that the actual rates vary considerably from the estimated rates on some of the activities. Participation rates will vary with time as the variables that impact the rates change. Some of the variables associated with population are age, family composition, residence location, changes in consumer tastes, and income.

Current Recreational Use

As would be expected, recreational use at Jordan Lake follows the seasons and the weekly cycle. During the primary recreational season, from late spring through summer, facilities are used sparingly during the week; however, on weekends, boat ramps, swim beaches, picnic shelters, and campgrounds often fill to capacity and occasionally people are turned away.

Visitors to developed recreation areas come primarily to be near the water. Picnic sites and camp sites near the water are most popular, those away from the water receive less use.

Dispersed recreation is more likely to occur throughout the "off-season" and is less

Exhibit 20. 2007 Activity Participation Rates

Activity	Visitation	Participation Rate	Estimated Rate in Original MP
Picnicking	101,577	0.07	0.15
Boating	399,952	0.31	0.15
Fishing	326,586	0.25	0.30
Hunting	14,452	0.01	NC
Sightseeing	362,999	0.28	0.19
Water Skiing	72,049	0.05	NC
Swimming	290,311	0.22	0.19
Camping	56,699	0.04	0.25
Total Rate		1.23	1.23

NOTE: USACE visitation data 2007, NC refers to no computation

Facility Requirements

It is possible to use the calculated participation rates and insert them into formulas using projected population data to derive numbers of facilities required for future development. Those requirements can then be used to plan future development. However, there are several major problems with using this approach to planning at a project like Jordan that is located in an urbanized region.

For one, the formulas were developed primarily for use at USACE reservoirs that are primarily rural and attract visitors who use the project as a “destination”, often spending several days at the project. Visitation at Jordan has proven to be different, with most of it occurring as short-term day-use trips. The second major pitfall with traditional recreational planning methods is that developing the project to meet **all** of the highly populated market area's recreation demands would potentially exceed the social and environmental carrying capacity of the project, resulting in degradation of the project's natural resources and reduction in the quality of recreational experiences.

A third problem with using this approach to planning at Jordan Lake is that current USACE policy requires cost sharing with or funding by a non-federal sponsor on future recreational development. Initial recreation development was federally funded, but unless a specific congressional allocation is made, it is unlikely USACE will fund additional recreation development. Without a specific partner identified, it would be impractical to identify future facility requirements. It is more logical to set a general framework for future development and plan for specific facilities when a sponsor comes forward with an interest in developing additional facilities.

The fourth major pitfall is the fact that recreational preferences and demand change over time. The demand for recreation in terms of activity type, quantity, and quality changes as regional population characteristics change. Population density, the urban/suburban/rural breakdown, income, family composition, gender, age, personal preferences, education, and access are just some of the variables affecting recreational demand. To illustrate how significant the changes in recreation preferences are, Exhibit 21 shows the most popular adult recreational activities in North Carolina for 1973 versus a statewide household survey for 1989. As is evident, some activities listed in the 1989 survey (like the number one activity - walking for pleasure) were not even on the 1973 survey. Other activities, like hunting, have lost ground over the years as locations to hunt have dwindled and population characteristics have changed.

With increased urbanization, there will be increased demand for recreation land for a variety of non-natural resources-related purposes—soccer and football playing fields, golf courses, tennis courts, ball diamonds, etc. Also, requests for commercial recreation facilities (water parks, miniature golf, theme parks)

Exhibit 21. Recreation Activity Popularity 1973 versus 2003

1973 Rating	Activity	2003 Rating **	Activity
1	Pleasure Driving	1.	Walking for Pleasure
2	Sightseeing	2.	Driving for Pleasure
3	Picnicking	3.	Viewing Scenery
4	Playing Outdoor Games	4.	Beach Activities
5	Viewing Outdoor Games	5.	Visiting Historical Sites
6	Swimming (non-pool)	6.	Swimming (in Lakes, Rivers, and Oceans)
7	Nature Walk	7.	Visiting Natural Areas
8	Swimming (Pool)	8.	Picnicking
9	Fishing	9.	Attending Sports Events
10	Bird Watching	10.	Visiting Zoos
11	Golf	11.	Fishing - Freshwater
12	Hunting	12.	Use of Open Areas
13	Visiting Historic Sites	13.	Swimming (in Pools)
14	Camping	14.	Fishing - Saltwater
15	Power Boating	15.	Attending Outdoor Cultural Events
16	Bicycling	16.	Bicycling for Pleasure
17	Tennis	17.	Other Winter Sports
18	Water Skiing	18.	Camping, Tent or Vehicle
19	Horseback Riding	19.	Softball and Baseball
20	Mountain Climbing	20.	Hunting

*Source: North Carolina Statewide Comprehensive Recreation Plan 1973.

**Source: State of North Carolina; Department of Environment and Natural Resources; Division of Parks and Recreation, North Carolina Statewide Comprehensive Outdoor Recreation Plan, 2003-2008, page II-18, Table II-6.

compete with private, city, and community recreational facilities (which also compete with each other in some cases) can be expected to increase. There may be pressure to convert Jordan Lake land to those purposes in outgrants to local governments. The land is perceived as “free” and is in large parcels. Although USACE and the State of North Carolina are not opposed to outgranting recreational lands, it will be Master Plan policy to give priority to protecting the natural resources base, while allowing compatible outdoor, natural resources-related recreational development. Recreation and natural resource management must be integrated in order to provide for high quality recreation while protecting and enhancing the natural resource base.

Proposals for recreational development will be evaluated for agreement with the resource objectives identified in this plan and by the methodology established in the Land Use Review Policy and Procedures (see Appendix C). Chapter 7 contains information on the resource objectives and the Land Use Review Policy and Procedures is detailed in Appendix C.

Public Input

As part of this MP, the public was asked to voice their concerns about the management and future development of the Jordan Lake. By far, the overwhelming public comments were for more trails (walking, equestrian, and mountain biking).

The public input results correlate well with statewide recreational preferences which indicate that walking for pleasure is the number one recreation activity. The results also track the rise in popularity of mountain biking, although participation in mountain biking is still relatively low among the general public. The close knit, though relatively small, horseback riding community also showed their organizational strength in the public input process. In summary, the responses from all trail users point to the demand for all trail types within the project area. Trail demand and supply are discussed in more depth in Chapter 7.

In addition, the Wilmington District contracted with Colorado State University Department of Natural Resource Recreation and Tourism to study boating recreation on Jordan Lake. This was a baseline study intended to determine the characteristics of boating activity and boaters’ perceptions of boating conditions on the lake. Data collected from boaters and in public listening sessions indicates that opportunities to enjoy fishing, relaxing in or swimming from their stationary boats, away from high amounts of moving boat traffic and heavy wakes, are important to users.

Boaters' primary concerns are increased boat traffic and crowding, conflicts with other boaters, and unsafe boat operation, and the risks posed by unmarked underwater obstructions and shallows. Ramp users also highlighted facility deficiencies at ramps with too few restrooms, garbage cans, and courtesy docks. The scenic and largely undeveloped shoreline of the lake, along with its proximity and size, are important features of the lake that boaters value. Boaters requested restrictions on personal watercraft use, more boater education, and more lake patrols. Requests were made for more beaches where boats can be landed.

Summary

Use of facilities at Jordan Lake varies with the season of the year, the day of the week and the weather. On Memorial Day, the 4th of July and nice weekends early in the summer, overnight facilities are filled to capacity and day-use facilities overflow with traffic backed up at entrance stations. Campgrounds typically reach capacity on those weekends, but operate below capacity much of the year. On average weekends throughout the summer, day-use facilities (and swim beaches in particular) are full with traffic back-ups at entrance stations; boat ramps are often full on weekends from mid-day through late afternoon. At boat ramps with entrance stations, visitors are turned away when parking reaches capacity, while at unstaffed facilities, boat trailer parking overflows onto road shoulders, medians and nearby roads.

With the population of the area surrounding Jordan Lake growing rapidly, the demand for outdoor recreation will continue to increase. In planning for future recreational use, USACE and the managing agencies will consider recreation development proposals that are compatible with existing outdoor recreation activities, and are oriented to the natural resources base of the lake and surrounding lands. Such proposals must be environmentally sound and help promote a diversity of safe, high quality, sustainable outdoor recreation opportunities. However, some recreation activities (field sports, golf courses, or similar recreation activities) are not compatible with the goals for Jordan Lake. Of particular concern for the future are goals of providing high quality recreation experiences under increasing demand while protecting and enhancing the natural resources base.

Changing demographics and public interest make a strong case for regular Master Plan Updates. The need for updates should at least be evaluated on at least five-year intervals. Between updates, the Operational Management Plan and the managing agencies' annual work plans will be used to implement the vision of the MP.



5

5

Public Involvement and Coordination with Other Agencies

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Public Involvement and Coordination with Other Agencies

5

U.S. Army Corps of Engineers Policy

In the development, operation, and management of civil works projects, USACE policy requires close and continuing cooperation with federal, state, and local agencies interested and responsible for public recreation, fish and wildlife resources, preservation of archeological and historic resources, and environmental quality. Accordingly, appropriate agencies were notified about this update to the Master Plan (MP) and participated in the planning, development, and review process.



In particular, the North Carolina Department of Environmental and Natural Resources (Division of Parks and Recreation, Division of Forest Resources, Wildlife Resources Commission), and other agencies that are stakeholders in the lands and waters at Jordan were instrumental in the development of this Master Plan. They accomplished this by identifying existing use patterns, problem areas, needs and opportunities, and objectives for future management and development of the resources. Their input is an integral part of this MP.

Public input was also sought and became a part of the plan. During the initial development of the MP, a public notice was distributed to the North Carolina State Clearinghouse and to an additional mailing list of local and federal agencies, environmental and sportsmen's groups, and other potentially interested parties. Copies of the existing MP were made available at USACE management center and at all county offices within the project area for review purposes. Input from private citizens, clubs and organizations, as well as governmental agencies, was considered and incorporated into the MP as appropriate.

In addition, a study on recreational boating at Jordan Lake was conducted in conjunction with this updated Master Plan. The boating study included both oral and written surveys of lake users. After data was analyzed by the managing agencies and proposed management actions considered, the public was invited to comment at both an open house and through the USACE website. The survey results and public comments are the basis for the policies and management actions related to boating and lakeside development.

In 2002 a draft of the updated MP was made available for review at the USACE Jordan Lake Visitor Assistance Center, on the Jordan Lake website, field offices of the managing partner agencies, the Archdale Building in Raleigh and the county planning offices for Chatham, Durham, Orange and Wake Counties for an approximate eight-week review period. In addition, the report was posted on the USACE district website.

In 2007 when the Master Plan was resumed, comments from 2002 were incorporated along with additional comments from the managing agencies. The final draft was then submitted for a 60 day public review. Responses received from review of the draft during both the initial input solicitation period and the later period are too numerous to include in the report, however, the general categories of comments are from the final public review are summarized in a table in Appendix F.

Summary of Meetings, Workshops, and Input from other Agencies

Initial meetings with local, state, and federal agencies are summarized below.

1. Location: Jordan Lake Visitor Assistance Center, Dec 1, 1994; Reason for meeting: first official contact with USACE resource management personnel to discuss overall needs for the update of the MP.
2. Location: The North Carolina Department of Environment, Health and Natural Resources office, Raleigh, N.C., Feb 24, 1995; Reason for meeting: to meet with state and federal agencies to discuss all agencies' needs to update of the MP.
3. Location: Jordan Lake Visitor Assistance Center, May 26, 1995; Reason for meeting: review with agencies the present status of the Master Plan update and solicit further input.

4. Location: Jordan Lake Visitor Assistance Center, Dec 11, 1995; attendees are listed in Appendix E. Reason for meeting: provide project status and gather input from all agencies for the development of the "Land Classification Drawing."

5. Location: Durham City/County Planning office, Jan 25, 1996; Reason for meeting: to exchange information about the ongoing Master Plan update and receive specific information on City/County future development plans.

6. Location: USACE, Wilmington District office, Apr 9, 1996; Reason for meeting: to receive N.C. Div of Parks and Recreation input on "Land Classification Drawing."

Major meetings associated with the Boating Study and completion of the initial draft Master Plan included the following:

7. Location: Various locations. Dec 1998-May 2001. The preparation of the MP was delayed, for approximately two years, by a study on recreational boating. Significant milestones during and following the study were the following:

Data collection—June to mid-August 1999

Inter-agency stakeholder workshop—June 2000

Public listening sessions—October 2000

Inter-agency stakeholder workshop—January 2001

8. Location: Jordan Lake – N.C. State Parks Jordan Lake office. Mar 15, 2001. Reason for meeting: to gather input from partner agencies and to provide an update on the master planning process.

9. Location: Archdale Building, Raleigh, NC. Jan 15, 2002. Reason for meeting: to distribute latest draft of MP to partner agencies and solicit written comments.

Major meetings associated with resuming the Master Plan included the following:

10. Location: Jordan Lake — USACE Visitor Assistance Center. June 26, 2007. *Reason for Meeting:* to restart Master Plan and confirm managing agencies intent.

11. Location: Jordan Lake — USACE Visitor's Assistance Center. Nov, 15, 2007. *Reason For Meeting:* Public Listening Session to start 60 day public review.

12. Location: Jordan Lake — USACE Visitor Assistance Center. Feb, 26, 2008. *Reason For Meeting:* review public comments with managing agencies.

13. Location: Jordan Lake — USACE Visitor Assistance Center. Apr 24, 2008. *Reason for Meeting:* discuss trails issues with managing agencies and county governments.

Problems and Constraints

Jordan Lake has been in operation for over 25 years, enough time for agencies and the public to identify problems and constraints to public use of the lake. Of course, many problems have been identified and resolved in the usual course of management. However, several problems and challenges have not yet been resolved and many of these are addressed in this update of the MP.

The "Resource Plan" section of this document contains recommendations and strategies to address these problems and constraints. The managing agencies, local governments, or the public identified the following issues as challenges to optimum management of the project. The issues listed are not equal in importance and the list should not be interpreted as all-inclusive.

- ⇒ *The North Carolina Wildlife Resources Commission (NCWRC) does not have a legislative mandate or funding to manage for non-consumptive recreational uses. NCWRC management efforts are directed at hunting and fishing per statutory directives and these programs receive management priority over other recreational uses.*
- ⇒ *Land managing agencies are managing their forest resources across the Jordan Lake landscape according to very different philosophies, practices, and objectives.*
- ⇒ *Various groups are interested in the development of trails for hiking, horseback, riding and mountain biking. The difficulty is in few are willing to accept responsibility for managing trail use and users, maintaining the trail and protecting the resource base. Each of the partner agencies has limited funds, manpower, and lands for trails.*
- ⇒ *Increased suburban development on the northern and eastern portions of the project has had several impacts, including land use requests for infrastructure development on project lands, increased encroachment potential, and increased demands for restrictions on hunting.*
- ⇒ *Some project lands are inaccessible for management and recreational purposes. These areas are shown on Drawing 11, Access Needs, Appendix G.*
- ⇒ *Resource issues such as illegal hunting and trash accumulation need to be coordinated among partner agencies.*
- ⇒ *The valuable resources of the lake should be interpreted through educational programs and signage indicating water supply lake, habitat protection, endangered species, etc.*

Problems and Constraints—cont'd

- ⇒ Various jurisdictional issues between land managing agencies exist and competing resource objectives involving water supply, recreation, flood damage reduction, hunting and habitat protection need to be balanced. It has been suggested that a coordinating body could be created at Jordan Lake to help address these concerns.
- ⇒ Wildlife viewing opportunities are limited.
- ⇒ Public interest indicates that increased efforts to serve the dispersed, non-consumptive recreation users would be worthwhile. Currently at Jordan, the NCDPR primarily provides opportunities for users of developed sites, and the NCWRC primarily provides opportunities for hunters and fishermen.
- ⇒ Native American tribal concerns need to be identified and addressed per the requirements of the Native American Graves Protection and Repatriation Act, Executive Order 13007: Indian Sacred Sites, and the Archaeological Resources Protection Act.
- ⇒ The lines of responsibility for management of historical properties and their protection from vandalism, looting, and collecting need to be clarified.
- ⇒ Interpretation of the historical resources and regulations about their use are either lacking or not well publicized. Visitors have little awareness about the project's cultural resources.
- ⇒ Surveying cultural resources on project lands has proceeded in a piecemeal fashion, causing delays in implementation of management activities, as well as providing an incomplete picture of the project's total cultural resources.
- ⇒ Boat users are beginning to feel crowding on the lake and report conflicts and boating safety concerns with other lake users. Of particular concern are conflicts with Personal Water Craft (PWC). Boaters are also concerned with unmarked physical hazards in the lake, such as tree stumps. Boaters like the undeveloped shoreline around the lake.

6

Land Allocation and Classification

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Land Allocation and Classification

Land Allocation and Classification

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Introduction

All project lands are acquired fee simple or under easement to support authorized project purposes. The purposes for Jordan Lake as authorized by Congress are flood control, water supply, water quality control, recreation and fish and wildlife conservation.

Land Allocation

Land allocation is the identification and documentation of lands at USACE projects in accordance with the authorized purposes for which they were acquired. There are four primary land allocation categories applicable to USACE projects; however, lands at Jordan Lake were purchased under only two of these allocations. Drawing 12 shows the location of the allocated lands.

Operations Land. Lands (43,372 acres) were acquired for operation of the project, i.e., flood control, water supply, water quality control, recreation and fish and wildlife conservation. All lands were acquired under this authority with the exception of the lands acquired for public recreation.

Recreation Land. Lands (2,677 acres) were acquired in accordance with the authorizing documents for public recreation. Lands allocated in this category are often referred to as “Separable Recreational Lands”.

Two other categories were **not** used in the purchase of lands for Jordan Lake:

Fish and Wildlife Land: Separable lands acquired for fish and wildlife management. No lands were purchased under this allocation.

Mitigation Land: Lands acquired or designated to offset losses associated with the development of the project. No lands were specifically purchased under this allocation; however, mitigation is discussed more fully in the the “Land Classification” section of this chapter.

Land Classification

Allocated project lands are further classified to provide for development and resource management consistent with authorized project purposes, as well as the provisions of the National Environmental Policy Act and other federal laws. The classification process refines the land allocations to fully utilize project lands, while considering public desires, legislative authority, and regional and project-specific resource requirements and suitability. Despite the classification titles, there are no single purpose lands. All lands should be managed to achieve the maximum sustainable mix of benefits. Drawing 13 depicts the land in the following classification categories:

Project Operations Land. This category includes lands used for the dam, dikes, spillway, and outlet structure, as well as lands used by the managing agencies for offices, maintenance compounds, and other areas used solely for project operations.

Recreational Land. This category includes lands developed for intensive public recreation activities and areas for concession development. Developed recreation areas are operated by each of the managing agencies, although the North Carolina Division of Parks and Recreation operates the majority of areas in this classification category.

Mitigation Land. Although no lands were specifically acquired for mitigation (and therefore are not classified as such on the land classification drawing), USACE agreed, during consultation with the U.S. Fish and Wildlife Service, that 10,000 acres of project land would be in permanent wildlife management, and that seven wildlife subimpoundments totaling 1550 acres would be built and managed for waterfowl habitat and hunting opportunities. The locations of the subimpoundments and permanent wildlife lands are identified on Drawing 14.

Environmentally Sensitive Areas. Lands in this category include North Carolina Natural Heritage Areas or Natural Heritage Occurrence Sites, significant archaeological sites, and significant endangered, threatened, and rare species habitats and associated communities. In order to protect the features of these areas, the Environmentally Sensitive Areas are not graphically depicted in this plan. Lands in this category also fall under other classification categories, but management practices should ensure that these areas are not adversely impacted.

Multiple Resource Management. Lands in this category are managed for one or more of, but not limited to, the below activities to the extent that the activities are compatible with the primary allocation(s). The majority of project lands are classified as multiple resource management lands. Frequently, more than one subcategory applies (for instance, low-density recreation along with wildlife and vegetative management).

- * *Recreation - Low Density.* This subcategory includes hiking, walk-in camping (designated campsites only), wildlife observation, hunting, bank fishing, and similar low-density recreation activities. The majority of project lands support these types of dispersed recreation.
- * *Wildlife Management General.* This subcategory includes lands where fish and wildlife management activities occur. The managing agencies are involved in fish and wildlife management activities, which include habitat improvement, monitoring of various species, direct population manipulation, and other management techniques. The North Carolina Wildlife Resources Commission manages gamelands throughout the project on a permanent and interim basis.
- * *Vegetative Management.* This subcategory includes lands where the managing agencies implement activities for the protection and development of forest and vegetative cover.
- * *Inactive and/or Future Recreation Areas.* This subcategory includes lands where recreation areas are planned for the future. Future recreation areas are available for development by local governmental entities or the State of North Carolina. These lands will be classified in the multiple resource management category until such development occurs. No Jordan Lake recreation areas are inactive.

Easement Land. This category includes 719 acres of land for which the government does not hold fee title, but did acquire a flowage easement that satisfies the requirements of the reservoir's flood pool. These privately-owned lands are used and managed in accordance with the terms and conditions of the easement estate acquired. No public facilities or public access is authorized on easement lands. Primarily, these lands are located at the upper reaches of the flood control pool south and east of Chapel Hill and south of Durham.



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Resource Plan

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Resource Plan

Introduction

The Resource Plan includes three distinct sections that together set guidelines and policies for management and development of all project lands and waters. The first section lists resource objectives outlining general management and development policies. The second section discusses future recreation development considerations, and remaining undeveloped recreation areas and their potential for future development. The third section covers specific recreational activities in terms of existing demand, resources, issues, and initiatives.

Because all future development must be either 50-50 cost shared or totally paid for by a sponsor, no attempt is made to specify particular activities at particular locations. Instead, as future development sponsors show interest, USACE, the State of North Carolina, and other managing partners will work with them to assess feasibility and suitability of proposals consistent with Jordan Lake's resource objectives, the potential of the particular site, and public interests.

Resource Objectives

Resource objectives are broad policy statements that guide future development and management of natural and cultural resources. Resource objectives consider authorized project purposes, applicable Federal laws and directives, regional needs, resource capabilities, and expressed public desires.

Resource objectives are usually common goals and are not normally in dispute. However, if a disagreement about resource objectives arises that is not addressed by the lease between USACE and the State of North Carolina or by a sublease, then the managing agency on a site, USACE, and a representative for the Chief Deputy Secretary of the NCDENR will resolve the disagreement. NCDENR has designated NC Division of Water Resources as the State's point of contact.

Specific resource objectives were developed for each of the following issues:

- | | | |
|-----------------------------|----------------------|------------------------------------|
| • Natural Resources | • Recreation | • Fish and Wildlife |
| • Natural Plant Communities | • Forestry | • Cultural Resources |
| • Access | • Project Operations | • Land Use Planning/
Management |
| • Water Quality | • Safety | • Aesthetics |

Natural Resources

Natural resources will be actively managed for multiple uses wherever possible, with emphasis on enhancing and protecting environmental quality. Multiple uses may include recreation, fish and wildlife, forestry, water quality, cultural resources preservation and interpretation, and aesthetics. Natural resources require management to protect water quality, help sensitive and declining species and communities to recover and to ensure public recreation and other uses are sustainable.

Visitor awareness of impacts caused by misuse of natural resources will be increased through improved public participation programs, media information programs, and interpretive activities.

Professionals in the fields of recreation, biology, forestry, landscape architecture, ecology, and related sciences will be employed to implement and monitor resource management programs.

Recreation

Jordan Lake will provide diverse, sustainable, high-quality natural resource based recreation opportunities. Recreation development will capitalize on land and water resources, within the principles of environmental sustainability. Natural resources have limited “carrying capacity” requiring stewardship and management to achieve sustainability. Sustaining these resources may mean limiting recreation capacity and regulating user numbers. Accordingly, future development shall be in line with the capability and suitability of the resources, and in keeping with congressionally authorized purposes for the project.

Jordan Lake, with its finite land and water resources, cannot satisfy the region’s demand for all types of recreation, while maintaining high quality experiences and environmental quality. Future development will be of the type that utilizes the resources to their best advantage, i.e., recreational uses that are

natural-resources-dependent (both land and water-oriented), and that provide users the opportunities to enjoy and learn about those resources. Accordingly, Jordan Lake's role in the regional recreation spectrum will be to provide open space and outdoor recreation opportunities, rather than facilities that are more appropriate for urban and suburban parks, such as ball field complexes and golf courses.

- * Future development should include increased opportunities for trail users, bank and pier anglers, and non-consumptive wildlife observers.
- * Recreation facilities will be sited in areas with environmental features suitable for the specific use.
- * Facilities and programs for people with disabilities will be provided in accordance with provisions of the Americans with Disabilities Act.

Recreation resources will be monitored regularly for recreation experience quality, environmental quality, and public safety. When indicators identify adverse effects, management practices shall be adjusted to protect the quality of the resources.

Fish and Wildlife

Endangered, rare, and unique species of plants and animals, and unique ecological habitats will be protected and managed for their health, vigor and recovery. Providing both diverse cover types and differing successional stages of vegetation through active management will enhance native wildlife populations.

Jordan Lake is an important regional resource offering extensive contiguous wildlife habitat in a region where urbanization increasingly fragments wildlife habitat. Future development will be designed to avoid negatively impacting this unique and critical capability. Agencies will continue to work and coordinate on management programs and activities, to sustain and enhance plant and animal populations, and to ensure the continued public enjoyment of both consumptive uses such as hunting and non-consumptive uses. Additional opportunities for non-consumptive enjoyment of wildlife shall be provided through development of observation areas and interpretive programs and other appropriate means.

Endangered, threatened, special status species, and declining species will be monitored and managed to improve their viability within the region. The intent of improving viability is to recover species and communities that are in decline, before they become "listed", and to work for their long-term survival before more costly and potentially less effective efforts are required.

Fishery populations will be monitored to determine stocking and harvest impacts and adjustments required. Tournaments will be managed to avoid negative impacts to fisheries.

Natural Plant Communities

Rare, endangered, or declining plant species and/or plant communities will be identified, protected, and managed to enhance these areas. Jordan Lake’s land resources include a wide range of microclimates and soil types with varied growing conditions. Within these conditions, the managing agencies will promote the protection of a diversity of native plant communities that are representative of the Piedmont region.

Endangered, threatened, special status species, and declining species will be monitored and managed to improve their viability within the region. The intent of improving viability is to recover species and communities that are in decline, before they become “listed”, and to work for their long-term survival before more costly and potentially less effective efforts are required.

Exotic and invasive plants compete with and displace native species. In order to protect native species, managing agencies will implement programs for control and removal of exotic and invasive species that pose problems to native plant species. Use and planting of native species will be actively promoted.

Forestry

Forest resources will be managed to ensure healthy and diverse forests through the execution of management plans that are collaboratively developed by the State of North Carolina, USACE, and other managing partners. The objectives of forest management include wildlife habitat, aesthetics, forest health and vigor, reducing the risks of wildfire, insect and disease infestations, the maintenance of a variety of cover types and tree species, and the maintenance and recovery of natural forest communities. Management plans will seek an optimal balance between resource objectives.

Thinning, regeneration harvests, and prescribed burns will remain important tools where appropriate for achieving the desired wildlife and forest management objectives. Interpretive programs shall be used to increase visitor awareness and understanding of forest management.

Cultural Resources

Known significant archaeological and historical resources shall be protected by all land managing agencies. Completion of a cultural resources inventory of all project land is a goal and will be pursued as resources permit. All planned construction, forestry, and other land modification activities in areas not previously surveyed and/or cleared in the Historic Properties Management Plan will be reviewed by a State or USACE archaeologist and surveyed when deemed appropriate. Implementation and updating of the Historic Properties Management Plan and the GIS database will continue. Public awareness and appreciation of cultural resources will be enhanced through means such as interpretive programs or signage.

Access

Public access to project lands and waters will be available for recreation use, except where sensitive resources or public safety require restrictions. Improving public access, particularly pedestrian access, will be pursued by all land managing agencies. Private exclusive use of project lands or facilities is not authorized at Jordan Lake. Facilities will be accessible within the requirements of the Americans with Disabilities Act (ADA).

Project Operations

The operation of Jordan Lake is a complex interaction of nature, man, and science. Project operations require balancing the authorized project purposes of flood control, water supply, downstream water quality, fish and wildlife conservation, and recreation. At times, the purposes conflict, such as when recreation facilities are flooded while holding back damaging flood waters and protecting downstream communities. Natural resources and recreation must be managed to complement overall project operations and support public and project security.

Sharing information with the public is an important part of garnering support for multi-purpose operations. To promote understanding of project operations, various methods such as static and interactive displays, public education efforts, interagency public listening sessions and web pages explaining operational purposes, features, and guidelines will be used.

Land-Use Planning/Management

Proposed land uses will be considered in the context of congressionally authorized project purposes, public interests, capability and suitability of the project resources, and applicable laws and regulations. The focus of land-use policy is to

ensure that Jordan's lands and waters are used and/or developed in accordance with authorized project purposes, in compliance with environmental statutes, in consonance with USACE Environmental Operating Principles, and in the best long term interests of the general public.

USACE and the partner agencies will work with local officials to ensure they make informed decisions about projects under their jurisdiction that might impact or be impacted by Jordan Lake, in order to avoid potential and/or predictable problems in water pollution, waste disposal and building encroachments on public property. Working with local officials will also assist in preventing conflicts that can arise from close proximity of legitimate and existing usage of public property (such as hunting or other recreational uses) and adjoining private development.

Requests for outgrants and easements will be evaluated using the District's Land Use Review and Evaluation Process. Requests are reviewed for consistency with authorized project purposes, natural resource management policies, and USACE real estate policies. Benefits and impacts are identified and analyzed. An incremental impact analysis is completed for each request to confirm that saturation limits are neither exceeded for any single resource, nor group of resources. Alternatives to using public lands are normally required when the requested land use is not consistent with authorized project purposes. If public land must be used, impacts are minimized and measures to mitigate for negative impacts will be required to make Jordan Lake "whole".

Mitigation options include land transfers, monetary compensation or other appropriate actions. In general, land use requests will likely be declined when they conflict with the project's resource objectives, do not integrate with recreation and natural resource management programs, do not promote or support natural resource based recreation, are not sustainable, and/or consume or diminish the natural resource base upon which the reservoir and our public recreation programs depend. More information on this topic is contained in Appendix C, Land Use Request.

Water Quality

Water quality protection is essential for recreation and water supply, and is an integral part of responsible stewardship of the natural resources at Jordan Lake. Accordingly, development and management practices shall meet or exceed state and local government water quality rules.

Recognizing that water quality is affected by all activities in the watershed, the managing agencies shall work with local and state agencies on water quality issues throughout the watershed where appropriate. Water quality in the reservoir is the result of actions by private landowners, industries, municipalities and utilities

recreation, water supply and other uses is primarily dependent on regulatory agencies such as the NC Division of Water Quality managing and enforcing water quality regulations within the watershed. On Jordan Lake's land and water, USACE and the partner agencies will work to protect water quality by protecting the shoreline from damaging development, maintaining a forested shoreline, and restricting proposed land uses that would adversely impact physical and chemical characteristics of surface waters and storm water runoff.

Safety

Safety is of the highest concern to USACE and the managing partners. All agencies are committed to safe visitor experiences and have active safety management programs tailored to their needs and the demographic profiles of their visitors.

Recreation facilities and programs will be evaluated for risk management factors and appropriate safety features and programs shall be developed. Enforcement of existing regulations and continued cooperation between law enforcement agencies will remain a priority.

An active safety program for all agencies will include a variety of safety programs that may include, among other items, interpretive programs and handout materials about potential hazards at Jordan Lake. Managing partners will actively support and participate in the Jordan Lake Safety Council. Working through the Council, members will pursue joint safety initiatives.

Aesthetics

Aesthetic considerations at Jordan Lake involve both natural and man-made features. On the natural side, Jordan Lake offers a unique opportunity to protect and manage large tracts of various vegetative and topographic features and associations that characterize the Piedmont region of North Carolina. These natural features provide a natural resource base, contribute to high quality outdoor recreation experiences, provide opportunities to learn about the natural world and our place in it and provide some respite from the pressures of the modern world. On the man-made side, the project includes buildings, roads, trails, and other site features.

Accordingly, all land management practices will protect and promote regionally representative natural landscapes and will utilize native and non-invasive plant species. In addition, all man-made features will, as much as possible, blend into the natural landscape and reflect the traditional Piedmont North Carolina rural architecture of the surrounding region.

A visual buffer of natural vegetation will be maintained along the shoreline to screen development from lake users. Wherever possible, parking areas and other utilitarian features will be screened from the lake surface and major recreation areas. Only essential shoreline development, such as beaches, boat ramps, or fishing piers, will be exempt from this screening. Buffering along the shoreline will serve dual purposes: aesthetics and protection of water quality.

All land-use requests will include an aesthetic assessment in the review process. All requests will be reviewed in accordance with the District land-use review process (see Appendix C). Whenever it is necessary to site new facilities or route overhead and underground utility lines and pipes on project lands, they will be sited and routed to reduce their visual impacts on lake and recreation area users.

Future Recreation Development

Regional Recreation Role

Jordan Lake is the largest contiguous public open space in the “Research Triangle” area of North Carolina between the urbanized areas of Raleigh, Chapel Hill, and Durham. As such, it is uniquely able to fill an environmental and recreational niche that is important to regional sustainability of native plant and animal communities and to human quality of life.

Accordingly, Jordan Lake’s role in the regional recreation spectrum will be to provide open space, wildlife habitat, and natural resource-based outdoor recreation opportunities, rather than to provide facilities that are most appropriate for urban and suburban parks such as sports fields and golf courses.

Future development will be natural resources dependent (both land- and water-oriented) that protects the open space character of Jordan Lake, and provides users the opportunities to enjoy and learn about those resources.

Environmental Considerations

Future development will be based on sound environmental planning that minimizes adverse effects on natural and cultural resources. Development will be placed in areas of suitable soil, slope, and vegetation that avoid and protect unique resources, reduce soil erosion, and protect against sedimentation of project waters. One tool available to assist in this determination is the project GIS database, which may be updated and expanded where necessary. The GIS can be used to help identify the most suitable areas for specific types of development. On-site investigations should be pursued to further evaluate sites for development.

Cost Sharing

Under the lease agreement between USACE and the State of North Carolina, USACE funded 100 percent of initial recreation development, which has been completed. A copy of the prime lease is included in Appendix B. The State may provide additional facilities and services necessary to meet public demand and within carrying capacity, either directly or through sublease agreements with third parties, or through a 50-50 cost-sharing agreement between the State and USACE. Unless Congressional appropriations are made for cost-sharing, it is unlikely USACE will fund additional development. USACE may direct-lease areas under its management or areas that have been removed from the prime lease.

Subleases

Subleases are subject to the terms and conditions of the prime lease and the approved Master Plan. Clear lines of responsibility must be established in all subleasing arrangements to ensure that environmental compliance, natural resources management, and other responsibilities are clearly assigned. Subleasing to local governmental agencies requires review and approval of the entity's proposed development, and financial and management capabilities. The North Carolina Department of Environment and Natural Resources (NCDENR); the District Engineer, Wilmington District, and the Chief, Real Estate Division, Savannah District, must approve all sublease agreements in writing before implementation. All sublease requests are subject to review for consistency with project purposes, policies, and resource objectives.

Other options for future recreation areas are direct leases from USACE to the sponsoring local governmental agency. A direct lease would require approval from the prime lease holder (State of North Carolina) for the withdrawal of lands from the prime lease, and upon receipt of such approval, modification of the prime lease. Direct leases are subject to the same review items as subleases.

Carrying Capacity

The National Park Service defines carrying capacity as "the level and type of visitor use that can be accommodated while sustaining the desired resource and social conditions that complement the purposes of the park units and their management objectives." The goal of determining carrying capacity is to maintain and improve the quality of diverse recreation opportunities while protecting and improving the natural resource base.

The USACE natural resources mission statement refers to the responsibility to "manage and conserve natural resources, consistent with ecosystem management principles, while providing quality outdoor recreation experiences to meet the needs of present and future generations." Therefore, consideration of carrying capacity is essential to protect the quality of the environment and the quality of the experience.

There are no magic numbers to determine carrying capacity, although that approach has been tried. Rather, it is more useful to define carrying capacity as a desired set of conditions for which to manage. Monitoring and measurement of the appropriate resource and social indicators replaces the measurement of maximum use.

Both visitors and managing agencies determine desirable conditions. Providing for diverse visitor preferences and needs depends on the following information:

- ⇒ *Use patterns - which recreation activities occur and where?*
- ⇒ *Preferences - which recreation experiences do visitors seek and which attributes contribute to those experiences?*
- ⇒ *Perceptions - how do visitors feel about present conditions?*
- ⇒ *Natural resource conditions—how are they being impacted?*

Clearly, focusing on these desired conditions requires managers to monitor use, resource conditions, trends, and visitor perceptions. The intent of management should be to prevent deterioration of the desired conditions. If the desired resource and social conditions are found to be deteriorating, management practices must be implemented to correct the problems.

Potential Future Recreation Areas

The original Jordan Lake Master Plan identified several potential future recreation areas based on environmental suitability, accessibility, and projected future demand. Development has already taken place at two of the areas identified for future development: Morgan Creek and Wilderness Island.

Morgan Creek . The North Carolina Department of Cultural Resources manages a small area surrounding the Mason House Historic Site; the Wildlife Resources Commission manages the remainder of the site which has been designated as permanent wildlife management lands.

Wilderness Island and River Junction. Wilderness Island and the adjoining Rivers Junction were re-designated as permanent wildlife management lands (and, therefore, removed from the list of future recreation areas). Minimal development in the form of an access road for pedestrian use has taken place on Wilderness Island (parking is provided at Rivers Junction). The island (actually a peninsula) is managed for hunting, hiking and wildlife observation.

The remaining undeveloped areas shown on Drawing 14, Potential Future Recreation Areas, total 4,565 acres, which compares to 2,634 acres in existing intensive recreation development. (Intensive recreation areas include facilities such as swim beaches, campgrounds, picnic shelters, picnic sites, boat ramps, and parking areas. Existing intensive recreation acreage does not include areas used for low-density recreation, such as hunting, nature study, and hiking on multiple resource management lands).

Future development proposals are not included as part of this plan; however, all proposals must address environmental suitability factors (for instance, topography, soils, vegetation, and environmentally sensitive areas), the identified resource objectives, and recreation trends and demands. Proposals will be reviewed using USACE Land Use Review Process that identifies benefits and impacts, and requires consistency with authorized project purposes and policies.

The environmental factors discussed in the following site descriptions are the most obvious known factors at the time of this plan's development. Additional onsite inspections and more in-depth investigations of the site may reveal other factors that may affect site development.

The sites described on the following pages are identified as potential future recreation areas for development by the State or local governments (private use is prohibited by USACE regulation at Jordan Lake. Actual boundaries of the sites may be adjusted based on approved site development plans. Site names may also change as requested by development sponsors.

Bells Landing. Bells Landing (543 acres) is located approximately one mile south of U.S. Highway 64 on the western shoreline of the lake, with access via Secondary Road 1941. The site is wooded with upland hardwoods, pine, and abandoned fields that have succeeded to pine. The majority of the site has slopes of less than 10 percent; however, moderately steep slopes occur in several drainages. The site has two peninsulas that extend into the lake.

Environmental considerations on the site include features of archaeological significance as well as the presence of designated natural area, which contains stands of mature white oaks.

Stones Point.. Stones Point (50 acres) is located approximately four miles north of U.S. Highway 64 on the eastern shoreline of the lake, with access via Secondary Roads 1008 and 1752. Hardwoods dominate approximately 50 percent of the site. Over 90 percent of the site has a slope of less than 10 percent.

Sunset Woods. Sunset Woods (491 acres) is located approximately two miles north of U.S. Highway 64 on the eastern shoreline of the lake, with access via Secondary Roads 1008 and 1748. Forest stand composition is divided about equally among hardwoods, pines, and mixed pines and hardwoods. Over 90 percent of the site has a slope of less than 10 percent, but several drainages in the area have steeper slopes. It is centrally located on the lake with excellent view potentials.

Weaver Creek. Weaver Creek (780 acres) is located on a peninsula in the southern part of the lake, approximately four miles north of U.S. Highway 1, with access from U.S. 1 via S.R. 1700 and 1907, and from U.S. 64 via S.R. 1008 and 1907. The site is wooded with pine and hardwood stands and contains several old homesites. Over 75 percent of the site has slopes of less than 10 percent, with some lakeshore slopes of greater than 15 percent, especially in the area west of S.R. 1008.

Environmental considerations on the site include the proximity of bald eagle nesting habitat.

Living Farm. Living Farm (362 acres) is located on the east side of the reservoir approximately two miles south of U.S. Highway 64 on S.R. 1008 and approximately four miles north of old U.S. Highway 1. The name "Living Farm" derives from the idea of developing this area as an interpretive center with a living history farm. Formerly open fields are in early successional stages and wooded areas are predominantly pine. Slopes of less than 10 percent occur on over 90 percent of the site.

Rivers End. Rivers End (841 acres) is located approximately two miles north of U.S. Highway 1 with access via S.R. 1931, 1938, 1939, 1971, and Moncure Cove Road. The majority of the site is dominated by mature hardwood forest. The remaining area consists of relatively young pine stands and several old homesite areas. Upland slopes range from 10 percent in the southern and central portions, to over 15 percent as well as steep shorelines in the northern portion. Environmental considerations on the site include a proposed registered natural area that contains stands of mature oak-hickory forest.

Indian Creek. Indian Creek (210 acres) is located on the eastern shore of the upper lake, west of State Highway 751 about midway between Interstate 40 and U.S. 64. A small area of bottomland hardwoods occurs on the site, as well as old fields and pine and hardwood stands. Slopes of less than 10 percent characterize the site, with the northern portion almost flat.

Environmental considerations on the site include the presence of a plant species of concern, as well as proximity to eagle nesting habitat.

Holly Hollow. Holly Hollow (262 acres) is located on the eastern shoreline about three miles north of U.S. Highway 64, with access via S.R. 1008. Upland hardwood and pine stands occur about equally on the site. Over 90 percent of the site has slopes of less than 10 percent.

Beaver Point.. Beaver Point (693 acres) is located about midway between U.S. 1 and U.S. 64 on the eastern shoreline, with access via S.R. 1141, 1142, and 1903

from U.S. 64 and via S.R. 1135, 1141, 1142 and 1903 from U.S. 1. Upland hardwood and pine stands occur about equally on the site. Slopes are gentle to moderate.

Environmental considerations include proximity to bald eagle nesting habitat.

Bonsal Point. Bonsal Point (570 acres) is located about midway between U.S. 1 and U.S. 64 on the eastern shoreline, with access via S.R. 1008. Pine dominates on approximately 70 percent of the site, with mainly mixed hardwoods and pines on the remainder. The peninsular portion of the site is almost flat, but moderately steep shorelines occur on the western side, and slopes of less than 10 percent occur on the area near the railroad.

Environmental considerations on the site include proximity to eagle nesting habitat, as well as the presence of remnant longleaf pines that are protected in a designated natural area.

Recreational Activities Discussion

In addition to changes in recreational preferences since initial development of the project (see Exhibit 21), we also have the benefit of on-site observation. The following sections address specific recreation activities at Jordan Lake and consider both the results of studies and observed recreational use patterns specifically at Jordan Lake (see Drawing 15).

Picnicking

Picnicking continues to be identified in the *North Carolina Statewide Comprehensive Outdoor Recreation Plan: 2003-2008* (also known as the SCORP) as an activity with a high demand as well as a high participation rate. Initial recreational development provided for much of that use. Existing development includes 146 individual picnic tables as well as 10 picnic shelters of various sizes with an additional 78 tables, totaling 224 tables available. Observations indicate that current picnicking use does not require additional individual picnic sites, but suggests that future development of additional picnic shelters is warranted. Existing picnic shelters are often reserved for months in advance.

Extended family gatherings in growing user groups (Latino in particular) have fueled demand for table and grill arrangements larger than found on individual sites.



use (with a separate small swim beach and restrooms with showers). The lack of space for additional parking precludes building picnic shelters in some locations.

Construction of a community building available for year-round rental is proposed at Ebenezer Church. Completion of these projects would meet much of the demand for group picnicking.

Trails

Walking for pleasure is the most popular recreation activity in the North Carolina Outdoor Recreation Plan: 2003-2008. The demand for hiking is high with high public funding support. Demand for equestrian trails is moderate with low support for public funding. Mountain biking is an activity that was little known at the time that the original Master Plan for Jordan Lake was developed, but was reported in a 1994 Roper survey to be the fastest-growing, outdoor recreational activity. Demand for biking is high with moderate support for public funding. Demand for trail use is expected to remain high.



While the public enthusiastically supports additional trail development, the difficult issues of compatibility of different trail uses and adjacent land uses, as well as site suitability (environmental factors that restrict some types of trail development and use), and management and maintenance responsibilities must be addressed by the managing agencies and user groups before trails are constructed. The identification of an agency or entity to manage and be accountable for any new proposed trail is the first requirement before construction can begin. Other important points for future trail development are development of the trail to accepted standards, monitoring of trail use and correction of deficiencies.

Agencies and stakeholders should work together to resolve issues of potential conflict at the earliest possible stages of trail planning. Steering or working groups to guide new development and resolve problems are appropriate in this arena. Trails development and management will provide unique opportunities for new partnerships between user groups, local governments, and the land managing agencies at Jordan Lake. The Lakes Management Group, a leadership group convened by the Secretary of DENR with the Directors and representatives from NCDFR, NCWRC, NCDPR, USACE and others has identified an interagency working group to work trails issues at both Falls Lake and Jordan. The group should involve appropriate user groups and sponsors in planning, management, and maintenance.

Major existing and proposed trails are shown on Drawing 15 in Appendix G. Current development includes relatively short hiking trails at Vista Point, Parkers Creek, Poplar Point, Crosswinds, Ebenezer Church, Seaforth and New Hope Overlook, all of which are managed by NCDPR. In addition, the two-mile Weaver Creek Trail (hiking only) is on NCWRC-managed lands. Several short hiking trails are located at Poe's Ridge.

Trails under development include the American Tobacco Trail (ATT), a 23-mile rails-to-trails conversion project along an abandoned stretch of Norfolk-Southern rail line that is partially located on Jordan Lake lands on the eastern side of the lake on NCWRC-managed lands. Management responsibilities are shared among several agencies and volunteer groups for the multiple-use trail, with pedestrian, equestrian, and bicycling uses permitted.

The New Hope Creek Trail and the Third Fork Creek Trail are also currently proposed by Durham for pedestrian use. NCDPR is considering providing a pedestrian trail for mobility-challenged people at either the State Parks Management Center area or at Parkers Creek. Additional trails that provide connections between different recreational areas are recommended.

Fishing

Fishing is the most common recreational activity at Jordan Lake and has an almost year-round season, although the most popular months are in the spring. Fifty percent of North Carolina households participate in freshwater fishing according to the SCORP, which also ranks freshwater fishing as an activity with a high future demand. Fishing use falls into two main categories: bank fishing and boat fishing. Jordan has a reputation as a very good fishing lake.



Existing development for boat fishing includes 11 boat ramps with a total of 50 lanes and a marina (see Drawing 4, Recreation). Heavy use occurs on several of the boat ramps during summer weekends. Four bank-fishing areas with parking lots have been developed (also shown on Drawing 4). Bank-fishing use is dispersed throughout the lake with anglers accessing the lake primarily near bridge crossings. Handicapped accessible fishing piers are provided at the Jordan Dam Tailrace Area and the Bells Church Public Fishing Area off S.R. 1008 on White Oak Creek.

Any future development geared towards boat fishing should take into account the results of the 2000 Colorado State University study of boater recreation that

indicate problems with crowding occurring during peak-use periods (see "Boating" section).

Maintaining a quality fishery (including monitoring and stocking when necessary, regulating catches, and providing the desirable fish structure) is necessary to meet public fishing demand.

Bank-fishing access areas are popular and development of additional areas is recommended. Partnerships between the land managing agencies and the North Carolina Department of Transportation (NCDOT) could result in better roadside parking conditions and increased safety for bank anglers. Development of additional piers has been proposed by NCDPR and should provide bank anglers with access to deeper water. Appropriate locations of the piers will be determined.

Sightseeing and Wildlife Viewing

North Carolina households, in the most recent SCORP, reported driving for pleasure and viewing scenery as the second and third most popular outdoor recreational activities (following walking for pleasure). Many of Jordan's visitors engage in these activities, which will probably continue to be true for the foreseeable future, since these activities are not limited by economics or physical abilities. Development of a driving tour of the lake, with interpretive signage and/or a brochure about various sites, is recommended to reach these visitors. Good visual quality of the resources can also help to ensure positive sight-seeing experiences. Maintaining the natural shoreline and forested areas will enhance sight-seeing.

Wildlife viewing was engaged in by 35 percent of the State's residents, according to a 1996 survey by the USFWS, and public lands such as Jordan figure prominently in their destinations. The study indicated that twice as many people engage in wildlife watching as fishing, and there are about five times more wildlife watchers than hunters. However, little attention has been given to providing quality opportunities to this user group.

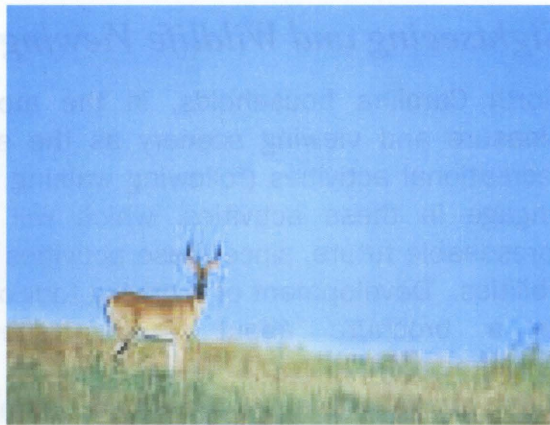


Factors to consider in siting additional wildlife observation areas include the presence of good wildlife habitat and a high probability of seeing wildlife, the site's environmental sensitivity and ability to withstand public use, accessibility, scenic quality, and conflicting uses.

NCWRC has identified several “Watchable Wildlife” sites and the NCDOT has installed signage (a binocular sign) indicating the direction to those sites. Better identification is needed to let the public know when they have reached the sites since they are currently not marked and their locations need to be indicated on project brochures. The sites also present the opportunity for interpretation and education about the wildlife and natural features that are present. The waterfowl subimpoundments should be considered for “Watchable Wildlife” sites.

Hunting

While the number of hunters has increased slightly since the development of the first Master Plan, they have not increased at the same rate as population growth. However, according to a 1996 survey by the U.S. Fish and Wildlife Service, their rates of participation (the number of days they engage in hunting) and their expenditures have both increased over the last several years. In urbanized areas (e.g. much of the market area for Jordan Lake), public lands are utilized by a greater percentage of hunters than in rural areas that have more private lands available for hunting.



Much of the Jordan Lake lands are designated as NCWRC-managed permanent wildlife management lands and other areas are designated as interim wildlife management. Both interim and permanent gamelands are open for hunting under gamelands regulations. Hunting is permitted in the USACE-managed area, but prohibited on lands managed by NCDPR and NCDNR. On the areas open to hunting, a variety of wildlife management techniques are employed to provide habitat for game species. Seven green-tree subimpoundments are managed for waterfowl habitat and hunting opportunities.

Demand for hunting opportunities at Jordan Lake is expected to continue. The main threat to continuing to provide those opportunities is residential and commercial development adjacent to project property. Often, this development is followed by requests to ban hunting on the adjacent public game lands and has sometimes resulted in local restrictions on hunting. Since development pressures along the Jordan property line will likely continue to increase, the challenge for managing agencies, user groups, local governments and nearby residents will be to resolve conflicting demands.

A similar challenge exists to achieve compatibility of low-density recreational uses (such as hunting and hiking), as hunting is viewed by some as incompatible with other outdoor recreation activities, such as hiking. The limited land base should not be “zoned” for separate uses, but instead should be managed for multiple uses where feasible. Easing the perceived conflict between uses requires a collaborative problem-solving approach. Shared management among agencies should be considered as a method of addressing user conflicts and conflicting objectives among land managers.

Camping

A 1996 Roper survey reported that 25 percent of Americans camped, either in tents or recreational vehicles (RV's). This high rate of participation, along with the continuing trend of people making frequent, close-to-home trips, indicate that camping at Jordan will remain in demand for the foreseeable future.



Current development for camping includes five campgrounds with 1172 campsites with electricity and water, 398 campsites without electricity and water, 25 walk-in campsites, and 11 group campsites. Observation indicates that campsite supply appears to be adequate for the immediate future, except for peak holiday and summer weekends when capacity is sometimes reached. Observation also indicates that campsites with the best access to the lake and/or views of the lake receive the most utilization.

Future development of camping facilities should take into account visitors' preferences for these types of sites, while protecting the vegetative buffer along the shoreline. The average RV is bigger today (longer and more likely to have slide-out sides) and has increased campers' demands for higher amperage sites and more pull-through or longer sites.

Another factor for consideration in future development is the popularity of bicycling, along with the likelihood that increasing numbers of visitors will want to bicycle and camp, and the need for integrating these activities if the potential exists.

NCDPR plans to make improvements to the Vista Point group RV campground by leveling and terracing some of the sites. They also plan to add an additional lane to the entrance road at Poplar Point to relieve congestion and reduce traffic back-ups that occur on the adjacent road (SR 1700) during peak times.

Swimming

According to the 1996 Roper survey, swimming continues to be a very popular activity, especially among a large part of the population in Jordan's market area. Area households fit a demographic profile that is especially likely to participate in fitness activities, activities involving small children, and water-oriented activities, which makes swimming a logical choice for one of their favorite activities.



Existing development includes six swim beaches, three of which are located within campgrounds and designated for camper use. The beaches in day-use areas open to the public are heavily used during the summer season and frequently meet capacity. Annually, hundreds of visitors are denied access to the beaches because of capacity restraints.

Additional swimming areas are needed to help meet demand and increase the quality of experience by reducing crowding and parking problems. NCDPR has proposed some new swim area development at existing recreational areas to meet some of these needs. They propose to add a swim beach at Crosswinds, utilizing and retrofitting the existing comfort station, and to construct an additional swim beach with comfort station at Vista Point.

Boating

Recreational boating continues to grow in popularity, as evidenced by boat registration statistics compiled by the U.S. Coast Guard. According to data compiled by the American Recreation Coalition, about 25 percent of Americans participate in some type of boating. The greatest increases in popularity since the first Master Plan have been in boating types other than traditional ski boats and bass boats. Personal watercrafts (PWC's) were a fast growing segment of the boating industry during the 1990's, however, numbers of PWC's sold have flattened since then. Almost 352,000 boats were registered in NC during 2003, with PWC's accounting for about ten percent of the total. Paddling sports (including canoeing, kayaking and rafting) have seen sharp increases. According to the American Recreation Coalition, paddlers now represent approximately 40 percent of all recreational boaters in the United States. Other boating related activities include fishing, water-



skiing and swimming.

Existing development at Jordan Lake includes 14 boat ramps with a total of 50 launch lanes, one canoe portage, one boat beach and a concessionaire-operated marina with storage for 320 boats.

Boating use at Jordan has reflected the national popularity of water sports, with parking at boat ramps sometimes reaching capacity on holiday and summer weekends. The presence of fishing tournaments at boat ramps has also at times contributed to congestion. The demographics of the market area (a large and relatively young population and good economy) indicate that high boating use will continue and probably increase as the population continues to grow as predicted. Sailing is popular in the Vista Point area, while windsurfers frequent Ebenezer Church. Whitewater paddlers most frequently use the Haw River portion of the lake near U.S. Highway 64, while flat water paddlers most often use quiet coves and the upper reaches of the lake.

Boating Study. In 2000, a recreational boating study was completed by Colorado State University researchers under contract with USACE and in conjunction with the managing partners and other public agencies. Study purposes included documenting current use of the lake, determining boater's perceptions of their visits, and determining the nature and magnitude of boating conflicts. Interviews, mailings, and boat counts were conducted and analyzed. USACE and the managing partners then developed proposed management options that were presented for public review at both a public meeting and an open website. USACE and managing partners met later to review the public comments and adjust their management recommendations appropriately.

A major study benefit is the establishment of a baseline for evaluating future boating conditions. In addition, it also helped agencies determine management and development actions to protect and improve the quality of boating recreation on the lake. Based on the results of the study, the managing partners agreed on the following recommendations:

- ⇒ *Establish a moratorium on any new development that adds boating capacity to the lake. The lake has reached a level of use where the public is beginning to feel conflicts and where their perceptions of their experience are negatively impacted. Additional motorboat usage during peak periods should not be encouraged. Accordingly, no additional marinas, boat launch areas or boat trailer parking shall be permitted on project lands.*

- ⇒ The behavior of Personal Watercraft (PWC) users was the source of many of the conflicts and negative comments in the survey. In response to those comments, several solutions were proposed. First, PWC educational classes need to be undertaken in conjunction with the PWC industry. Second, existing PWC laws should be vigorously enforced. Third, in order to give PWC a place to “perform”, the agencies will investigate developing a PWC course with an onshore viewing area.
- ⇒ To meet the diverse needs of the boating public, provision of quiet areas for fishing and relaxing should be considered. One proposal is to designate “Quiet Coves” for those purposes. These coves would be limited to no wake boating to reduce conflicts between users. Adjacent landside development should not conflict with the quiet cove theme.
- ⇒ To protect water quality and improve services to the public, existing launch ramps should be upgraded to include restrooms, trashcans, and courtesy docks.
- ⇒ For safety purposes and better lake utilization, shallow water, shoals, and underwater obstructions should be marked.
- ⇒ Develop management strategies that spread boating use more evenly, spatially and temporally. Strategies to encourage more weekday and off-season use, as well as use of less-congested parts of the lake are advised.

Data collection for the study was undertaken prior to implementation of new statewide PWC regulations, which include stricter age limits and new training requirements. The effects of their adoption should be monitored prior to implementing additional agency actions on PWC at Jordan.

Nongasoline-powered Boats. The popularity of paddle sports and sailing and their lesser impacts on saturation indicates that development for these types of opportunities is appropriate. The popularity of an area restricted to nongasoline-powered watercraft at nearby Falls Lake (Beaverdam area) indicates that this type of zoned use restriction can be well received by the public. The development of access for these types of craft in an area of the lake where a causeway separates the water body from the lake proper, or zoning a section of the lake, would be appropriate to better serve these users. Existing boating access sites could also be modified to better accommodate paddle sports access, and



"portage" access points could be identified in desirable areas away from power boat traffic.

Marinas. A concessionaire operates Crosswinds Marina under a sublease agreement that is administered by the NCDPR. The marina provides a boat ramp, slips and mooring, equipment rentals, service, fuel and supplies. Wet slips and dry storage are provided for up to 320 boats.



The original Master Plan indicated that, if demand dictated, a second marina could be constructed at Weaver Creek. In light of the concerns about boating saturation, a second marina is not recommended.



General Design Criteria

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Appendices

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General Design Criteria

General design criteria are presented to assist in the planning, construction, and maintenance improvements of project lands and facilities. The intent of this guidance is to establish a framework for proper development of new recreation areas and the rehabilitation of existing areas at Jordan Lake.

All types of development should begin with a conceptual plan. The conceptual plan should cover the entire development, including future plans, rather than considering work items on a piecemeal basis. The conceptual plan can be phased to accommodate budget requirements and should show the general layout of proposed work. It should include items such as the locations of roads and parking lots, structures, utilities and other facilities. From the conceptual plan, detailed final design plans in accordance with applicable engineering or technical manuals and design standards will be prepared.

Guiding Principles

General considerations that should be addressed when designing a new recreation area or rehabilitating an existing area include the following:

- * Consider functional use, creative design, environmental harmony, and economy of construction.
- * Maintain health, safety, security, and comfort of visitors.
- * Meet local and regional recreational needs, considering the present requirements as well as recreation trends and potential future needs.
- * Create user friendly areas and facilities to serve all populations. This includes incorporation of universal accessibility design principles to address accessibility and user diversity.
- * Protect resources from physical and aesthetic degradation. This includes correction of existing environmental problems such as erosion, siltation, soil compaction and vegetation loss.
- * Correct existing design problems.
- * Provide for ease and economy in cleanup and maintenance.
- * Meet stated management and natural resource objectives and sustainable development goals.

Three topics that apply to all of the facilities on the following pages are mentioned below for emphasis.

Universal accessibility (UA). Design all new and updated facilities and environments to be universally accessible. The target is 100 percent of facilities such as campsites and picnic sites to be universally accessible. The standard that must be met is that the minimum number of universally accessible facilities such as campsites and picnic sites comply with current UA guidance.

Consideration of pool fluctuations. When developing lakeside facilities, fluctuations in water levels shall be considered, to avoid unnecessary placement of facilities in hazardous areas. Such facilities as habitable buildings, washhouses, and comfort stations; septic systems and water systems (except “closed systems”); and other structures subject to substantial damage from inundations, must generally be placed above the 100 year flood frequency elevation. Such facilities, when placed below the 100 year flood frequency elevation, must have no practicable alternative, be flood proofed, and comply with state and local floodplain regulations and building codes. Such facilities as circulation roads, parking, picnic sites, and campsites may generally extend to the 5 year flood frequency elevation. The specific characteristics and usage of each facility must be considered in establishing its appropriate location relative to flood frequency elevations.

Utilities placement. Place power and communication lines in recreation areas underground. If overhead power lines are absolutely necessary place them where they will not be a safety hazard and are in accordance with ER 1110-2-4401 “Engineering and Design—Clearances for Electric Power Supply Lines and Communication Lines Over Reservoirs”.

*

Bicycle routes and lanes should be incorporated in the design of new roads. Improvements to existing roadways can also create lanes for cyclists. Bicycle parking should be convenient to access points, high use facilities and drinking water and restrooms.

Roadway Design Guidelines			
Feature	Two-Way Road	One-Way Road	Service Road
Paved or hardened surface suitable for intended purpose	Required	Required	Required
Minimum paved width	24 ft (7.3 m) Required	14 ft (4.3 m) Required	
Width of shoulder base material on each side	2 ft (0.6 m) Required	2 ft (0.6 m) Required	1.5 ft (0.5 m) Required
Minimum clearing width for construction	34 ft (10.4 m) Required	20 ft (6.1 m) Required	
Crowned cross sections providing adequate slope for drainage	Required	Required	
Minimum overhead clearance	16 ft (4.9 m) Required	16 ft (4.9 m) Required	
Minimum centerline turning radius for curves and turnouts	50 ft (15.2 m) Required	50 ft (15.2 m) Required	
No trees within: • 3 ft (0.9 m) of paving • Ditches • Back slope areas	Required	Required	

Roads and Parking Areas

Access into a recreation area should be limited to a single road whenever possible to promote the safety and security of the visiting public and for ease of management of the recreation area. Additional guidance for roads and parking facilities is provided below.

Roadways and parking areas should be paved when possible, typically constructed without curb and gutter. The use of porous pavement materials instead of asphalt for the parking area and the access drive should be considered. These materials would encourage infiltration of storm water.

Roadways and parking areas help create the customers' first impression regarding the quality and type of recreation experience an area offers. The design, layout, and orientation of roads and parking areas should:

- * Preserve a park-like character with minimal impact on the site, avoiding the appearance of a thoroughfare.
- * Avoid disturbance of significant park features and vegetation.
- * Provide convenient, enjoyable, and safe access to facilities.
- * Avoid significant barriers to pedestrians traveling between activity areas.

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Minimum centerline turning radius for curves and turnouts	50 ft (15.2 m) Required	50 ft (15.2 m) Required	
No trees within: • 3 ft (0.9 m) of paving • Ditches • Back slope areas	Required	Required	

Parking area design should promote:

- * Public safety.
- * Effortless vehicle circulation.
- * Convenient facility access and ease of parking by the user.

The goal that a first time user can easily understand access into and out of the area.

Parking areas shall be designed for customer convenience, safety, and ease of parking with well-defined striping, curbs, barriers, and signage to encourage orderly and proper parking. Circulation patterns should be simple, direct, and obvious to the driver. Pull-through parking shall be utilized to the maximum extent possible for RV units, buses, and vehicles pulling trailers to eliminate the need for backing. Parking spaces angled to the flow of traffic are encouraged for safety and user friendly aspects for all vehicles. In certain areas there may be a demonstrated demand for parking spaces larger than the standard. Site factors and actual demand will determine the number and location of these spaces.

Parking Area General Design Guidelines		
Item	Recommended	Minimum Requirement
Parking area	As close as practical to activity served	No more than 500 ft (152 m) from activity served
Parking grade	1-5%	8% maximum grade
Maneuvering aisles and access areas: One way	20 ft (6.1m)	15 ft (4.6 m) (wider recommended for perpendicular aisles)
Two way	30 ft (9.1 m)	24 ft (7.3 m)
Inside turning radius	30 ft (9.1 m) all vehicles	30 ft (9.1 m) oversized vehicle
Parking space, car, standard: Perpendicular	9 ft x 20 ft (2.7 m x 6.1 m)	9 ft x 16 ft (2.7 m x 4.9 m)
Angled	9 ft x 22 ft (2.7 m x 6.7 m) (45-60 deg)	9 ft x 20 ft (2.7 m x 6.1 m)
Parallel	9 ft x 20 ft (2.7 m x 6.1 m)	8 ft x 20 ft (2.4 m x 6.1 m)

Parking Area General Design Guidelines (cont.)

Item	Recommended	Minimum Requirement
Parking space, oversize vehicle		
Angled	10 ft x 50 ft (3.1 m x 15.2 m) (45-60 deg)	10 ft x 40 ft (3.1 m x 12.2 m)
Parallel	10 ft x 50 ft (3.1 m x 15.2 m)	10 ft x 40 ft (3.1 m x 12.2 m)
Parking space, launch ramp		
Angled pull-through	10 ft x 50 ft (3.1 m x 15.2 m) (45-60 deg)	10 ft x 42 ft (3.1 m x 12.8 m)
UA, all types	Add 5 ft (1.5 m) to minimum width for all types of spaces	

Facility Parking Guide for Planning Purposes

Facility	No. and Type of Spaces	Per
Launch ramp	30 oversize 5 standard	Each launch lane Each launch lane
Swim area	1 standard 1 oversize	Every three swimmers Parking lot spaces may be increased based on local usage pattern
Picnic area	2 standard	Each table
Campsite	1-3 standard	Each campsite
Restroom	# of standard spaces that will fit into area	Parking area equal to length of restroom facility at a minimum, assuming perpendicular spaces
Playground	# of standard spaces that will fit into area	Parking area equal to length of playground impact area
Fish cleaning station	1 oversize	Every two fish cleaning spaces
Sanitary dump station	2 oversize	Each dump unit
Amphitheater	1 standard	Every four seats

Access to recreation areas should be controlled to protect the general public and project resources. A controlled entrance will improve safety, reduce vandalism, and provide for controlling the hours or season an area is available for use. Control gates and barricades will be located at main park entrances and other access points that must be temporarily closed for maintenance, hours of operation, seasonal closure, and security.

Utilities

Utilities are generally required for recreation areas and shall be designed to meet existing and anticipated future demands. Utilities should be designed to be functional, aesthetic, economical, easy to maintain, and user friendly. Utilities planning includes identifying adequate and affordable sources of the utilities needed, which typically include the following items.

Potable Water. Municipal or rural water systems shall be utilized when available. The development of water systems must comply with state and local regulations. Water supply must be adequate in quantity and quality to handle peak flow required to furnish water to restrooms, shower facilities, sanitary dump stations, and drinking fountains.

Sewage Treatment Facilities. Municipal sewage systems shall be utilized when available. The development of sewage systems must address state and local regulations. Sewage facilities must be designed to handle peak sewage discharge from restrooms, fish cleaning, and sanitary dump stations. When feasible, one wastewater treatment facility may service multiple recreation areas.

Electrical Services. Private power utilities serving the facility shall be contacted at the concept stage to ensure power is available in the vicinity and to ensure that utility connection charges are included in cost estimates. Where feasible, all electric power lines should be placed underground inside recreation areas.

Commercial Telephone Services. Accessible telephone or emergency call box service shall be provided in public use areas. At least one telephone or call box should allow for emergency calls to be made without coins. International symbol signs shall be used to denote phone or call box locations. Support amenities should include adequate parking, lighting, and shelter from the elements. Phone service should be provided at all entrance stations and maintenance facilities. Information on UA amenities such as volume control should be obtained through the local service provider.

Other sources if needed. Fuels such as propane or natural gas fuel systems may be used, but those systems and storage facilities must comply with Flammable and Combustible Liquids Code NFPA (National Fire Protection Association).

A designated corridor for placement of utility systems and infrastructure should be established to facilitate new construction and the prompt location of system problems when they occur. Design and placement should be accomplished by a certified professional to ensure that the corridor works in concert with other park systems.

Power and communication lines inside recreation areas should be placed underground. Care should be taken to maintain good as-built drawings of underground utilities. Conspicuous utilities such as storage tanks and onsite wastewater treatment systems shall be fenced and screened. Odor-generating utilities should be remote to and downwind of park user activities.

Adequate lighting for safety, security, and accessibility shall be designed into all facilities and recreation areas. This includes lighting access to buildings and major facilities.

Locations to be Lighted	
Boat ramps	Required
Parking lots with nighttime use	Required
Major road intersections	Required
Information facilities with nighttime use	Required
Public phones	Required
Maintenance areas	Required
Service facilities	Required
Installation Considerations	
A minimum of two light sources shall be used for interior lighting (Table 3.8)	Required
Mounted high enough to minimize the effect of glare and to prevent vandalism	Recommended
Spillover light pollution such as sky glow, light trespass and glare should be addressed through height, shields for uplight and directional aim	Recommended

Grading

New park facilities should be sited to blend with existing contours and the lay of the land. The following table summarizes slope recommendations in new park facilities. Minimizing the amount of cuts and fills required for a project reduces construction and maintenance costs. Areas with slopes over 15 percent will require excessive earthwork and should be avoided, unless there is no acceptable alternative.

Slopes for New Park Facilities – Campgrounds & Day Use Areas	
Allowable Range	2% - 15%
Most Economical Range	2% - 7%
Range Requiring Extra Cut & Fill	8% - 15%
AVOID: Slopes Requiring Excessive Cut & Fill	+15%

Slope facing of all cut and fill should be designed for ease of maintenance and passage by pedestrian park customers. Cut and fill slopes in excess of 3:1 may require the incorporation of terraces, retaining walls, stone riprap, or other measures to hold the soil in place. Heavily sloped or terraced areas adjacent to pedestrian footpaths or routes require barriers to prohibit access or the incorporation of paths providing safe passage across the slope.

Grading adjacent to buildings shall slope away from the buildings for a minimum distance of 10 feet to ensure positive drainage and to eliminate standing water.

Grading must direct surface water flow away from tent pads, hardened areas, picnic tables, or utility hookups. Park roads, parking areas, and walkways should be graded to allow the natural flow of surface water.

Grassed swales should be used instead of curb and gutter for conveyance, and water from parking lots and buildings should be sheet flowed into grassed swales or routed to bio-retention areas, also referred to as rain gardens. If parking lots are landscaped with islands, they should be designed as bio-retention areas instead of raised islands.

Landscaping

Landscaping can be used to improve park aesthetics, control erosion, improve safety, and reduce maintenance costs. Aesthetic improvements include use of landscape materials to screen undesirable views such as service and storage areas, parking lots, dumpster and trash receptacle locations, electrical transformers, and other negative features.

Landscape designs and plantings at Jordan Lake recreation areas should contribute to the natural appearance of the site. Many locations have an abundance of existing landscape elements that can be used in new construction or rehabilitation projects, including trees, shrubs, groundcovers, grasses, flowers, boulders, stones, rocks, soil, and water. Use of indigenous landscape materials preserves the character of the recreation area and may result in lower maintenance costs. The following steps shall be used to preserve natural appearance and make maximum use of indigenous materials:

- * Conduct an inventory of existing plant and site features prior to commencement of design activities. The PDT should use this inventory to document which features are most conducive to the proposed development.
- * Design for large expanses of undeveloped areas to remain undisturbed. This avoids habitat fragmentation and enhances users' experiences within natural areas.
- * Protect existing plants and site materials during construction.

The following required design criteria shall be applied:

- * Obtain information on plant materials, availability, suitability, and quality through local and state nursery associations, agricultural extension offices, or state forestry offices.
- * Specify replanting of the site with a variety and range of plants indigenous to the area.
- * Avoid the introduction of exotic plants.
- * Avoid the use of toxic or thorny plants, especially in areas of high pedestrian traffic.
- * Provide visual interest with landscape materials, particularly at park entrances.
- * Provide seasonal interest by specifying a variety of trees, shrubs, and flowers.
- * Address seasonal maintenance requirements to include:
 - Watering requirements for different types of vegetation.
 - Weed control.
 - Trimming of trees and shrubs.
- * Create buffers to improve traffic control, provide screening, or to separate differing uses and activities.

- * Promote security and safety through proper placement of landscape materials.
- * Emphasize low maintenance design considerations such as minimizing mowing and maintenance requirements and landscaping with drought-tolerant plants.
- * Minimize mowing requirements. Mowing is typically the costliest and most time-consuming vegetative management activity.
- * Keep grassed areas to the minimum required for aesthetics, line-of-sight visibility, and fire and erosion control. Maximum consideration should be given to creating natural or low maintenance areas that do not require mowing.

Boat Launch Areas

The 2000 study on boating recreation at Jordan Lake led to a moratorium on increasing motorboat numbers on the lake. Accordingly, no new launch areas or boat trailer parking are recommended, although additional launch ramps may be added to existing areas to ease congestion while launching and retrieving boats. Guidelines in this section apply to renovation or rehabilitation of existing boat launch areas.

- * At a minimum, each boat launch area should have a ramp, courtesy dock, adequate lighting, parking area, restroom, appropriate signage, and a tie-down parking area.
- * A well-defined turn around area should be separate from the parking area.
- * A canoe or small boat launch area should be provided in conjunction with the regular boat ramp use. A grassed shoreline or sand beach is best for this activity.
- * Where the access road into a ramp area is directly in line with the ramp itself, the road alignment should be corrected to avoid a “straight-in” approach to the water.

Boat Launch Ramps/Lake And River Access Design Features

General	
Ramp access provided for extreme high and low water conditions	Recommended
Upper limit of launch lane extends a minimum of 1 ft (0.3 m) above ordinary high water elevation	Recommended
Lower limit of a launch lane extends a minimum of 4 ft (1.2 m) below the typical low water elevation	Recommended
Minimum launch lane width of 15 ft (4.6 m)	Required
Launch ramp slopes • minimum of 12 degrees • maximum of 16 degrees	Required
Reinforced retaining walls not less than 1 ft (0.3 m) thick and 2 ft (0.6 m) deep constructed at the edges of all poured-in-place ramps to prevent undercutting	Recommended
Additional launch lanes considered where launch line waiting time exceeds 10 minutes during peak periods	Recommended
Approach	
Access roads to launch ramps require a deliberate turn from the approach onto the ramp. If a deliberate turn is not possible, use traffic control devices such as barricades, traffic islands, or berms to alert drivers that access roads are in direct alignment with the ramp	Required
A vertical curve (minimum of 15 ft (4.6 m)) constructed at the top of the ramp to: • Enhance the driver's vision while backing a trailer • Prevent dragging on the ramp surface at the juncture of the ramp apron	Required

Boat Launch Ramps/Lake and River Access Design Features (cont.)

Surface & Materials	
Launch ramp and ramp approach turnaround apron constructed of reinforced concrete: minimum thickness of 6 in. over a 6-in. base of compacted aggregate	Required
A finished launch ramp surface of 1 in. by 1-in. "V" grooves to provide maximum traction and make the surface self-cleaning: - Aligned at 60 degrees to the longitudinal axis - "V" groove direction alternated from lane to lane to aid in launch lane delineation	Required
Poured-in-place concrete ramps preferred. Pre-cast concrete units used where site conditions dictate.	Recommended
Access & Amenities	
Courtesy Docks provided	Required
UA loading platform or other UA boarding means provided	Required
Area lighting illuminates the launch ramp, parking area, and tie-down area	Required
Water safety, emergency phone numbers, and regulations posted on protected bulletin boards that are located so that boaters see them before entering the water	Required
Restroom provided within 500 ft (152 m)	Required
Ramp sites easily accessible from main access roads	Recommended
Tie-down lane, turnout or temporary parking spaces for boat rigging and de-rigging provided at each launch ramp area to minimize traffic congestion at the approach and exit. Room to park and walk around vehicle and trailer out of the traffic lanes provided (14 x 100 ft (4.2 x 30.5 m) minimum)	Recommended
Reflectors and/or painted lines used to delineate boat launching lanes	Recommended

Camp Areas

- * The preferred layout of campgrounds is that of small groups of individual campsites served by a common one-way loop road.
- * When possible, the campsites should be located on gently sloping sites (8 percent maximum).
- * The camp pad should be constructed without requiring excessive cut and fill on the site.
- * Native understory vegetation should be allowed to remain between campsites and other activity areas.
- * Pedestrian access from campsites to other activity areas should be defined and trailways properly surfaced.
- * Complete separation of day-use activities from campgrounds is required. If campgrounds have day-use activities for campers within the campground (e.g., boat ramp for campers, playgrounds, etc.), separation from the campsites is desirable.
- * Visitor access from the campsite to the shoreline is desirable; however, the finished pad elevation should be at least three feet above normal pool elevation of 216 m.s.l.
- * Native shade tree species shall be utilized and favored between campsites, adjacent to parking areas, and around facilities and activity areas to provide cooling, screening and noise reduction, and visual character and interest.

Campgrounds – General Considerations	
Physically separated from day use areas	Required
Single point of entry to the campground provided	Required
Designed and developed to offer a variety of facilities and camping experiences	Required
Existing vegetation preserved for screening, buffering, and shade.	Required
Access to sanitary dump station provided (except primitive areas)	Required
Additional (or dual) sanitary dump stations provided for campgrounds with more than 125 sites	Recommended
Automatic gates that can be operated from inside the entrance station and that allow after-hours departures	Recommended
All campsites in an area have firm and stable access routes to the hardened living area	Required
All Park Attendant campsites in the campground are universally accessible	Required
RV sites placed on relatively flat areas to avoid: - Sloped sites that will not accommodate RVs - Excessive site work required to create level site	Recommended
Camping spurs should follow existing topography	Recommended
Use more rugged terrain with fewer level areas for more primitive campsite developments	Optional
Utilities Checklist	
Water	
A minimum of one water spigot is required per four campsites	Required
Electric Pedestals	
Have 50-, 30-, and 20-amp (GFCI) hookups located at the pedestal	Required
Located: • 11 ft from the center of the pad • Between 5 and 15 ft (1.5 and 4.6m) from the back of the pad • At the driver side rear of the campsite	Required

Campsite Amenities and Support Item Checklist

Item	Multi-Purpose Site	Park Attendant Site	Tent-Only Site	Group Site
Hardened impact area	Required	Required	Required	Required
Potable Water (within 500 ft)	Required	Required	Recommended	Required
Picnic table	Required	Required	Required	Required
Fire ring/grill	Required	Required	Required	Required
Lantern hanger	Required	Required	Required	Required
Restroom (within 500 ft (152 m))	Required	Recommended	Required (except for primitive sites)	Required
Trash service	Required	Required	Required (except for primitive sites)	Required
Level parking spur	Required	Required	Recommended	Required
Access to additional parking	Required	Required	Optional	Required
Additional on-site parking (1-3 spaces)	Recommended	Recommended	Optional	Required
Individual water hookup	Recommended	Required	Optional	Optional
Individual sewage hookup	Optional	Required	Optional	Optional

Campsite Design Guidelines

Item	Criteria	Clarification
Minimum width of vehicle spur	12 ft (3.7 m) Required	Widths greater than 12 ft encouraged to provide extra parking at the site
Back-in campsite, standard length where terrain allows	Minimum 70 ft (21 m) Required	Site length measured from edge of road at the shortest side of the campsite. At least 30 ft (where the RV will park) shall be level
Back-in campsite alignment	40-60 deg angle Recommended	Angle measured from center line of road

Campsite Hardened Living Areas Checklist

A hardened living area with a fine crushed stone or other hard surface provided for each campsite	Required
Bordered by concrete curbing, plastic timbers, or other approved materials	Required
Located on the passenger side of a back-in or pull-through spur	Required
Covers an area up to 625 ft ² (62 m ²)	Required
An 18-ft (6.1 m) unobstructed area, measured from the utility pedestals into the hardened area, provided to accommodate RV slide-outs	Recommended

Tent Pads Checklist

A hardened surface to provide a durable all-weather surface for campers. Crushed stone (screenings) is recommended surface	Required
Bordered by concrete curbing, plastic timbers, or other approved materials	Required
Minimum of 16 ft X 16 ft (4.9 m X 4.9 m) standard size	Required
Can be detached from the living area as long as the tent pad is in close proximity with a pathway connecting both elements	Optional

Picnic Areas

- * Individual and well-defined impact areas should be created for each picnic unit.
- * Picnic units should be clustered in small groups served by a small group of parking spaces.
- * Well-defined trails and paths should be constructed leading from picnic areas to other activities such as beaches and restrooms.
- * Picnic units should be located within easy walking distance from parking areas.

Picnic Area Design Guidelines	
Separated from non-compatible uses such as campgrounds and marinas by a minimum of 200 ft (61 m)	Required
Scattered throughout a day use area, and developed to provide water frontage, shade and aesthetic views	Recommended
Located within 500 ft (152 m) of a restroom facility	Recommended
Trees or structures shade at least 50% of sites	Recommended
Located in conjunction with other amenities like swim areas, open fields, and playgrounds	Recommended
Located at least 50 ft (15.2 m) from main park circulation roads	Recommended
Parking located from 40 to 200 ft (12.2 to 61 m) from the picnic site	Recommended
Picnic sites separated a minimum of 30 ft (9.1 m) from center to center of hardened pad	Recommended
In addition to individual picnic sites, consider multi-table picnic sites of 2-6 tables to accommodate customer demand	Recommended
Picnic Site Amenities Checklist	
Access to trash facilities. For areas using individual trash receptacles, one container for every four tables	Required
Pedestral grill	Required
Access to drinking water	Recommended
At a multi-table site, a larger grill should be provided	Recommended

Swim Beaches

Swim areas may be designed in support of multiple use activities, as single use areas, for use by a specific group or in conjunction with facilities such as shelters. Designs with moderate slopes allow for larger areas to be delineated and provide greater dispersion of swimmers. Historic water levels during the typical operating season should be assessed prior to final site selection. The slope of the land both above and below the water line is one of the determining factors in the site selection for a good swim area. Moderate slopes are preferred because they allow larger areas to be buoyed to provide for greater dispersion of swimmers.

Swim area sizing should be based on the assumption that approximately 60 percent of the total number of bathers will be on the swim area at one time, with 30 percent in the water and 10 percent elsewhere. As a rule of thumb, a turnover factor of 3 will be used for design purposes. Ideally 50 ft² of sand and turf and 30 square feet of swimming area inside the buoyed safety area should be provided for each person. Swim area capacities will vary according to the attendance, supervision, size of swim area, anticipated usage, and type of swim area experience desired. Any space standard used to compute swim area capacity should be flexible enough to accommodate these factors. Parking areas should be sized to prevent overcrowding of swim areas.

Water quality and swim area planning must go hand in hand. The effects of the proposed swim area's physical site features on future operation and maintenance requirements must be considered as well. Safety of all users is the controlling factor at designated swim areas. It is paramount that the underwater swim area gradient be smooth and constant and that the underwater limit of this gradient be delineated in a manner that the user can easily recognize. These criteria meet user expectations for safe wading in a visually identified area.

Swim Area Design Guidelines	
Pollution Protection & Water Quality	
Barriers and coves often offer protection against wind and wave action, but dead-water coves should be avoided. Swim areas shall be located where adequate water circulation is present to: -Assure continued acceptable water quality -Remove surface debris that may deposit on the swim area	Required
Swim area sites located in areas where extensive sedimentation will not be a problem	Required

Swim Area Design Guidelines (cont.)	
Pollution Protection & Water Quality	
Design of swim areas provides protection from boats, fuel spillage, and drainage from sewage and boat wakes	Required
Runoff and drainage with pollution potential from any area upland of the swim area must be diverted.	Required
Diversion methods should complement the swim area development and minimize impact to the site. Acceptable diversion methods include: -Grassed swales -Terracing -Inlets -Landscaped walls	Recommended
Gradient	
Daily, seasonal, and yearly water level fluctuations due to irrigation, flood control, evaporation, power generation, or other factors must be considered in swim area design to assure optimum utilization	Required
Swim area gradient smooth and constant, without underwater obstructions, and designed to eliminate sudden changes in grade or drop-offs in the 0 to 5-ft (0 to 1.5-m) depth	Required
Slopes in the underwater portion of swim areas: -Range from 2% to 5% -Do not exceed 10%	Required
The maintained underwater gradient shall extend a minimum of 10 ft (3 m) beyond the delineated swim area	Required
The maintained underwater gradient shall be designed for water depths not to exceed 6 vertical ft (1.8 m) at the normal pool elevation typically experienced during the swimming season	Required
Delineation & Safety	
Swim area limits shall be delineated. Options include: -Floating pipeline -Buoy line	Required

Swim Area Design Guidelines (cont.)	
Pollution Protection & Water Quality	
Required	Design of swim areas provides protection from boats, fuel spillage, and drainage from sewage and boat wakes.
Required	Runoff and drainage with pollution potential from dry areas upland of the swim area must be diverted.
Recommended	Division methods should complement the swim area development and minimize impact to the site. Acceptable division methods include: - Grassed swales - Forming - Grills - Landscaped walls
Gradient	
Required	Daily, seasonal, and yearly water level fluctuations due to migration, flood control, evaporation, power generation, or other factors must be considered in swim area design to assure optimum utilization.
Required	Swim area gradient smooth and constant, without underwater obstructions, and designed to eliminate sudden changes in grade or drop offs in the 0 to 5-ft to 1.5-m depth.
Required	Slopes in the underwater portion of swim areas: - Range from 2% to 5%. - Do not exceed 10%.
Required	The maintained underwater gradient shall extend a minimum of 10 ft (3 m) beyond the delineated swim area.
Required	The maintained underwater gradient shall be designed for water depths not to exceed 8 vertical ft (2.5 m) at the normal pool elevation typically experienced during the swimming season.
Delineation & Safety	
Required	Swim area limits shall be delineated. Options include: - Flotation pipeline - Buoy line

Playgrounds

- * Safety of the children is the greatest concern in planning, design, construction and maintenance of all playground areas and equipment.
- * All playground areas should be located away from immediately adjacent roadways and parking areas as well as potentially hazardous water bodies.
- * Suitable "open play" areas with little or no equipment may be provided in recreational areas. A grass surface is the preferred ground cover in these areas.
- * Playground areas should be sited to permit casual parental supervision from nearby camp or picnic units or other activity areas.
- * Small playground units with play equipment should be located in "common" areas near clustered groups of picnic or camping units.
- * In intensive-use play areas, a deciduous tree canopy is preferred for midday shade while direct early morning sun is desirable for "drying off" play areas and equipment.

Playgrounds should be integrated within the site with access to parking and safe pedestrian access routes that provide separation from vehicular traffic and should be located in close proximity to other high-use activities such as group use facilities. The shape or limits of playgrounds are influenced by the existing conditions of the site and the play components that are provided. The playground area may be defined to allow the placement of desirable trees within the limits of the playground to provide shade. The National Recreation and Parks Association (NRPA) is a good source of information on playground safety and inspector certification.

Playground Design Guidelines

All play areas, surfaces, and facilities shall meet: -Consumer Product Safety Commission (CPSC) guidelines for safety -American Society for Testing and Materials (ASTM) Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use -When in conflict, the stricter standard will prevail	Required
Benches shall be provided at every playground, to encourage adult supervision of children. At least one to be located in the shade	Required
Restroom located within 500 ft (152 m)	Required
Drinking fountain provided near the playground	Required

Playground Design Guidelines (cont.)

Site graded for adequate drainage	Required
Slides positioned to face north or east in order to avoid heat from southern or western sun exposure	Recommended
Low tree limbs removed to discourage climbing	Recommended
Play area built above the ground with edge material raising the finished grade of the playground area a minimum of 6 in. (150 mm), bordered by concrete curbing, plastic timbers, or other approved materials	Recommended
Provide a separation of uses for children between the ages of 3 and 5 and the ages of 6 and 13 when possible	Recommended
Safety, low maintenance, and durability are primary concerns in choosing playground equipment. Pre-manufactured, modular, commercial-grade equipment is the most durable in most instances.	Recommended
Minimum of one playground provided for each park where activities such as camping or picnicking take place	Recommended
Located a minimum of 50 ft (15.2 m) from any roadway	Recommended
Trees or structures shade approximately 50% of the playground from direct sunlight	Recommended

Shoreline Stabilization

- * In areas where severe shoreline erosion exists or where problems will eventually occur, intensive stabilization efforts may be required to protect significant features or development. However, if the development could be improved by relocation to another area, then the extent of erosion control efforts should be carefully studied for feasibility.
- * The type of erosion control necessary for use on a particular site could range from vegetative planting, riprap, superficial grading, gabions, or a combination of bioengineering techniques.
- * Since the visual impacts of many types of shoreline treatment are undesirable, great care should be taken to produce aesthetically pleasing, as well as functional, solutions to erosion problems.

Appendices

Appendix A. Applicable Federal and State Laws and Directives

The following laws pertain to the construction, operation and management of the project. This list is not meant to be all-inclusive and does not identify all statutes relating to the operation and management of Jordan Lake.

Authorization

The **Flood Control Act of 1938** authorized the B. Everett Jordan Dam and Lake project, and **Public Law 88-253 (1963)** authorized construction.

Public Law 93-141 (1973), the B. Everett Jordan Dam and Lake Change of Name Act, changed the name of the project from "New Hope Reservoir" to "B. Everett Jordan Dam and Lake".

Environment

National Environmental Policy Act of 1969, as amended, 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; study, develop and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources; utilize ecological information in the planning and development of projects, and include an environmental impact statement in every recommendation or report on proposals for major Federal actions significantly affecting the quality of the human environment.

Endangered Species Act, as amended, requires that Federal agencies shall, in consultation with the Fish and Wildlife Service (or the National Marine Fisheries Service), utilize their authorities in furtherance of conserving endangered and threatened species and take such actions as necessary to assure that their actions are not likely to jeopardize such species or destroy or modify their critical habitat and sets up a procedure of coordination, assessment, and consultation.

Appendix A. Applicable Federal and State Laws and Directives (cont.)

Public Law 85-624, Fish and Wildlife Coordination Act, as amended, requires that wildlife conservation receive equal consideration with other features of water-resource development programs; that proposals for work affecting any body of water be coordinated with the U. S. Fish and Wildlife Service (USFWS) and the state wildlife agency; that recommendation of the USFWS and the State agency be given full consideration; and that justifiable means and measures for wildlife purposes, including mitigation measures, be adopted. It requires that adequate provision be given for the use of project lands and waters for the conservation, maintenance, and management of wildlife resources, including their development and improvement. It also provides that the use of project lands for wildlife management is in accordance with general plans approved jointly by the U. S. Army, the U. S. Department of the Interior, and the state wildlife agency.

North Carolina Environmental Policy Act of 1971 sets forth the State's policy regarding the conservation and protection of North Carolina's natural resources.

Public Law 86-717, Reservoir Areas - Forest Cover Act, provides for the protection and development of forest and other types of vegetative cover and requires the establishment and maintenance of other conservation measures to yield maximum public benefits. PL 86-717 requires that the lands be developed and managed to encourage future dependable timber resources and to increase their value for conservation, recreation, and other beneficial uses.

Public Law 89-669, Fish and Wildlife Conservation Act of 1973 requires that federal landholding agencies shall seek to protect native fish and wildlife that are threatened with extinction and, to the extent practical and consistent with the primary purposes of these agencies, shall preserve habitats of threatened species on lands under their jurisdiction.

Other Pertinent Federal and State Laws

Public Law 89-72, Federal Water Project Recreation Act of 1965, as amended, requires that full consideration shall be given to opportunities for recreation and fish and wildlife enhancement; that recreation planning be based on coordination of use with existing and planned federal, state, and local recreation; and that non-federal administration of recreation and enhancement areas be encouraged. It also requires that, without cost sharing, no facilities for recreation and fish and wildlife enhancement are provided except those justified to serve other project purposes or as needed for public health and safety.

Public Law 93-291, Preservation of Historic and Archaeological Data Act of 1974 permits the expenditure of up to one percent of the amount appropriated for the construction of a civil works project for the surveying, recovering, analyzing, and

Appendix A. Applicable Federal and State Laws and Directives (cont.)

porting of important data, which may be lost as a result of project development under the Corps jurisdiction. This data may be of scientific, historical, archaeological, or paleontological significance.

Public Law 93-303 of 1974, on Recreation User Fees. By amending Section 4 of **Public Law 88-578, the Land and Water Conservation Fund Act of 1965**, this act allows collection of "fair and equitable" user fees for campgrounds operated on federal lands by federal agencies. It does not grant the Corps the authority to assess an entrance fee for general use of project resources except where specialized facilities, equipment, or services are provided.

Section 4 of the Flood Control Act of 1944 (PL 573 - 78th Congress), as amended in 1946, 1954, 1962, and 1975, authorizes the use of water resource development project lands for public recreation by specifically allowing the construction, maintenance, and operation of public parks and recreational facilities in reservoir areas under the control of the Secretary of the Army. Additional authorization for development of public recreation at power, flood control, and navigation projects is included in **Section 209 of the Flood Control Act of 1954, Section 207 of the Flood Control Act of 1962**, and by the **Land and Water Conservation Fund Act of 1965, as amended**.

Archaeological and Historic Preservation Act ("Reservoir Salvage Act"), as amended, provides for the preservation of historical and archaeological data, which 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; for coordination with the Secretary of the Interior, whenever activities may cause loss of scientific, prehistorical, historical or archaeological data; and for expenditure of funds for recovery, protection and data preservation.

National Historic Preservation Act, as amended, states a policy of preserving, restoring, and maintaining cultural resources and requires that federal agencies take into account the effect of any undertaking on any site on or eligible for the National Register of Historic Places; afford the Advisory Council on Historic Preservation opportunity to comment on such undertaking; nominate eligible properties to the National Register; exercise caution in disposal and care of federal property which might qualify for the National Register, and provide for the maintenance of federally-owned and registered sites.

Archaeological Resources Protection Act of 1979 protects archaeological resources and sites which are on public lands; fosters increased cooperation and exchange of information between governmental authorities, the professional community and private individuals; and establishes requirements for issuance of permits by federal land managers to excavate or remove any archaeological resource located on public lands.

Americans with Disabilities Act of 1990 (ADA), Public Law 101-336, addresses universal accessibility guidelines and sets accessibility standards for disabled individuals, which must be applied during the design, construction, or alteration of public buildings and places of business. The law also covers employment provisions, public services, public transportation and telecommunications.

The **State Parks Act** sets forth a mission statement for the state parks system. It states that the system functions to preserve and manage representative examples of significant biologic, geologic, scenic, archaeological, and recreational resources, and that park lands are to be used by the people of the state, visitors and descendants, in order to promote understanding of and pride in the state's natural heritage.

Executive Orders

EO-11593 provides for the protection and enhancement of the cultural environment.

EO-12512 provides for a review of public lands for excessing and retention.

EO-11988 Flood Plain Management

EO-11990 Protection of Wetlands

EO-12898 Federal Actions to Address Environmental Justice in Minority Populations and Low Income Communities and Low Income Populations

EO-13045 Protection of Children from Environmental Health Risks

EO-13186 Protection of Migratory Birds

Engineering Regulations (ER)

The following U.S. Army Corps of Engineers regulations impact project operations. This list is not meant to be all-inclusive, but does contain a majority of the regulations directly affecting civil works project operations.

ER 1110-2-400, Design of Recreation Sites, Areas and Facilities

ER 1130-2-406, Shoreline Management at Civil Works Projects

ER 1130-2-426, Challenge Cost-Sharing Program

ER 1130-2-530, Flood Control Operations and Maintenance Policies

ER 1130-2-540, Environmental Stewardship Operations and Maintenance Policies

ER 1130-2-550, Recreation Operations and Maintenance Policies

ER 1165-2-400, Recreational Planning, Development and Management Policies

Appendix B. Lease with the state of North Carolina

SEP 24 1981

DEPARTMENT OF THE ARMY LEASE

10 August 1981

FOR PUBLIC PARK, RECREATIONAL, AND FISH AND WILDLIFE PURPOSES

B. EVERETT JORDAN LAKE PROJECT

Received NRM 5 NOV 81

REAL PROPERTY DIVISION

LEASE NO. DACW21-1-81-2603

THE SECRETARY OF THE ARMY, under authority of Section 4 of the Act of Congress approved 22 December 1944, as amended (16 U.S.C. 460d), hereby grants to the STATE OF NORTH CAROLINA, hereinafter designated as the State, a lease for a period of fifty (50) years commencing on 1 September 1981, and ending on 31 August 2031, to use and occupy approximately 45,478 acres more or less of land and water areas under the primary jurisdiction of the Department of the Army, hereinafter designated as the Government, in the B. Everett Jordan Lake Project area, hereinafter referred to as the premises, as shown on Exhibit "A" attached hereto and made a part hereof, for public park, recreational, fish, wildlife and other natural resources management purposes.

THIS LEASE is granted subject to the following conditions:

1. The State shall be responsible for care and custody of the lease premises in accordance with the "Division of Responsibilities" designated as Exhibit "B" attached hereto and by this reference made a part hereof. The State shall conform to such regulations as the Secretary of the Army may issue to govern the public use of the Project area.

2. The State shall administer and maintain the premises in accordance with the approved Master Plan; Concessionaire General Development Site Plans, which may be amended from time to time as necessary; Exhibit "B" and an annual management plan agreed upon by and between the State and the Wilmington District Engineer, hereinafter referred to as the District Engineer, or his authorized representative. The annual management plan will be submitted to the District Engineer during the month of January each year. Such annual management plan shall include but is not limited to the following:

a. Plans for management activities to be undertaken by the State or jointly by the Government and the State including improvements and other facilities to be constructed.

b. Budget of the State for carrying out the management and development activities.

c. Personnel to be used in the management of the area.

d. Plans for supervising, patrolling, and policing the leased areas including water areas.

e. Fish, wildlife, and forestry work plans.

3. a. Subject to availability of funds, the Government agrees to fund 100 percent of costs of initial programmed development as shown in the Master Plan. The State may provide additional facilities and services necessary to meet the public demand either directly or through concession agreements with third parties. Formal agreements with private groups, clubs, associations, and quasi-public groups will not

Appendix B. (cont.) Lease with the state of North Carolina

be encouraged; however, the needs of these groups may be accommodated by permitting advance reservation of group camp areas.

b. The format for all formal agreements between concessionaires and the public and a list of all rules and regulations prescribed by the concessionaires, must be submitted to the District Engineer for approval.

c. Parking or user fees may be charged by the State for the entrance to or use of the premises or any facilities constructed thereon subject to prior written approval by the District Engineer.

d. Rates and prices charged by the lessee or its concessionaires for accommodations, food, and services furnished or sold to the public shall be reasonable and comparable to rates and prices charged for similar goods and services by others in the community and on Falls, B. Everett Jordan, and John H. Kerr Lakes. The lessee shall, not less than 15 days prior to 30 April of each year that this lease remains in effect, submit to the District Engineer a list of the rates and prices (except packaged goods) proposed for the following year and furnish justification for any proposed rate or price change. No further action will be taken unless the District Engineer finds items that are priced unreasonably. If items are found to be priced unreasonably, the District Engineer will establish a price comparable to prices for the same goods or services as other businesses within the same geographic area and will notify the lessee of the established price. Where no change in the previously approved price list is proposed, a letter stating that the previous year's list will remain in effect for the coming year will be acceptable. The lessee shall post the schedule of rates and prices in conspicuous places on the leased premises at all times.

4. All monies received by the State from operations conducted on the premises including, but not limited to, timber harvesting, parking fees, user fees, rental or other considerations received from its concessionaires may be utilized by the State for the administration, maintenance, operation, and development of the premises. Any such monies not so utilized or programmed for utilization shall be paid to the Government at the end of each 5-year period. The State shall establish and maintain adequate records and accounts and render annual statements of receipts and expenditures to the Government. The receipts of annual or weekly entrance fees collected at other State-operated recreational areas but honored at this State-operated area are not subject to this accounting. The Government shall have the right to perform audits of the State's records and accounts and to require the State to audit the records and accounts of third-party concessionaires and furnish the Government a copy of the results of such audit.

5. All construction, landscaping, and archaeological work accomplished by the State shall be in accordance with plans approved by the District Engineer. The State shall keep the premises in good order and in a clean, sanitary, and safe condition, and shall at all times maintain all structures and equipment in a condition satisfactory to the District Engineer.

6. The State shall not discharge waste or effluent from the premises in such a manner that such discharge will contaminate streams or other bodies of water or otherwise become a public nuisance. The State shall comply promptly with any regulations, conditions, or instructions affecting the activity hereby authorized if and when issued by the Environmental Protection Agency and/or a State Water Pollution Control Agency having jurisdiction to abate or prevent water pollution. Such

Appendix B. (cont.) Lease with the state of North Carolina

regulations, conditions, or instructions in effect or prescribed by the Environmental Protection Agency or State Agency are hereby made a condition of this lease.

7. The right is reserved to the Government, its officers, agents, and employees to enter upon the premises at any time and for any purpose necessary or convenient in connection with river, harbor and flood control work, to remove timber or other material required for such work, to flood the premises in accordance with authorized Project purposes, when necessary, and/or to make any other use of the land as may be necessary in connection with public navigation and flood control. The State shall have no claim for damages of any character on account thereof against the United States or any agent, officer or employee thereof.

8. Any property of the Government damaged or destroyed by the State, incident to the exercise of the privileges herein granted, shall be promptly repaired or replaced by the State to the satisfaction of the District Engineer.

9. The United States shall not be responsible for damages to property or injuries to persons which may arise from, or be incident to, the exercise of the privileges herein granted; or for damages to the property of the State; or for damages to the property or injuries to the person of the State's officers, agents, servants, or employees or others who may be on the premises at their invitation or the invitation of any one of them, arising from or incident to the flooding of the premises by the Government or flooding from any other cause; or arising from or incident to any other Governmental activities; and the State shall hold the Government harmless from any and all such claims to the extent authorized by the North Carolina Tort Claims Act, Chapter 143, Article 31, of the General Statutes of North Carolina.

10. The State shall require its concessionaires and sublessees to obtain from an insurance company licensed in the State and acceptable to the Government, liability or indemnity insurance providing for minimum limits of \$50,000 per person in any one claim, and an aggregate limit of \$150,000 for any number of persons or claims arising from any one incident with respect to bodily injuries or death resulting therefrom, and \$15,000 for damage to property suffered or alleged to have been suffered by any person or persons resulting from the operations under any agreement between the State and its concessionaires and sublessees.

11. This lease may be relinquished by the State at any time by giving to the Secretary of the Army, through the District Engineer, at least twenty-four (24) months written notice.

12. In the event that the State violates any of the terms and conditions of this lease, and continues and persists therein for a period of thirty (30) days after written notice thereof by the District Engineer, said lease may be revoked by the Division Engineer. In lieu of revocation, the District Engineer, in his discretion, upon a finding that a violation constitutes a health or safety hazard may suspend the use of that operation or facility until such deficiency is rectified.

13. That on or before the date of expiration of this lease or its termination by the State, the State shall vacate the demised premises, remove the property of the State therefrom, and restore the premises to as good order and condition as that existing upon the date of commencement of the term of this lease, damages beyond the control of the State and due to fair wear and tear excepted. If, however, this lease is revoked the State shall vacate the premises, remove said property therefrom, and

Appendix B. (cont.) Lease with the state of North Carolina

restore the premises to the condition aforesaid within such time as the Division Engineer may designate. In either event, if the State shall fail or neglect to remove said property and so restore the premises, then, at the option of the Division Engineer, said property shall either become the property of the United States without compensation therefor, or the Division Engineer may cause it to be removed and premises to be restored at the expense of the State, and no claim for damages against the United States or its officers or agents shall be created by or made on account of such removal and restoration work.

14. The State or its concessionaires shall not discriminate against any person or persons because of sex, race, creed, color, age, or national origin in the conduct of its operations hereunder. The State furnishes, as part of this lease, an assurance (Exhibit "C") that it will comply with Title VI of the Civil Rights Act of 1964 (78 Stat. 241) and Department of Defense Directive 5500.11, issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations.

15. All notices to be given pursuant to this lease shall be addressed, if to the State, to NC Department of Natural Resources & Community Development, P.O. Box 27687, Raleigh, NC 27611; if to the Government, to the District Engineer, U.S. Army Engineer District, Wilmington, P.O. Box 1890, Wilmington, NC 28401, or as may from time to time be directed by the parties. Notice shall be deemed to have been duly given if and when inclosed in a properly sealed envelope or wrapper, addressed as aforesaid and deposited, postage prepaid in a post office or branch post office regularly maintained by the United States Government.

16. This lease is subject to all existing easements, and easements subsequently granted for roadways and utilities located or to be located on the premises, provided the proposed grant of any easement will be coordinated with the State; and easements will not be granted which will in the opinion of the District Engineer, interfere with developments, present or proposed, by the State.

17. That, as of the commencement date of this lease, an inventory and condition report of all property and improvements of the Government included in this lease shall be made by a representative of the Government and a representative of the State to reflect the then present condition of said property. From time to time, there shall be added to said inventory and condition report such additional facilities as may be provided by the Government. A copy of said inventory and condition report shall be attached hereto and become a part hereof, as fully as if originally incorporated herein. At the expiration, revocation, or termination of this lease a similar inventory and condition report shall be prepared and submitted to the District Engineer, said inventory and condition report to constitute the basis for settlement by the State with the District Engineer for leased property shown to be lost, damaged, or destroyed, any such property to be either replaced or restored to the condition required by Condition No. 13 hereof, or at the election of the Government reimbursement made therefor by the State at the then current market value thereof.

18. The State may grant permits and licenses and sublease all or portions of the leased property for purposes which are consistent with the terms and conditions of this lease and with the approved Master Plan. All such grants shall state that they are subject to the provisions of this lease. The terms and conditions of permits, licenses, and subleases granted by the State shall first be approved by the District Engineer in writing. In order to protect the investments of sublessees, subleases may require the Government to continue to honor such parts of the subleases that are

Appendix B. (cont.) Lease with the state of North Carolina

necessary to assure the continuation of the subleased activities upon a default which would result in a revocation of the prime lease under Condition 12 hereof. All subleases for concessions and/or marinas shall provide for a rental charge commensurate with like concessions at similar regionally located projects.

19. The State shall not permit gambling on the premises or install or operate, or permit to be installed or operated thereon, any device which, in the opinion of the District Engineer, is contrary to good morals or is otherwise objectionable; or sell, store or dispense; or permit the sale, storage, or dispensing of any intoxicating beverages on the premises not specifically authorized in writing by the District Engineer; or use the premises or permit them to be used for any illegal or immoral business or purpose; there shall not be carried on or permitted upon the premises any activity which would constitute a nuisance.

20. Where designated beaches, swimming areas, and appurtenant facilities are authorized, the State agrees to conduct, equip and operate the facility in such manner as to provide maximum safety to user. The State will maintain posted notices as to when use is prohibited. Lifeguards will be furnished during authorized swimming periods.

21. The proceeds derived from timber harvesting accomplished in accordance with the approved Forest Management Plan may be used by the State for the maintenance and operation on said lease premises as provided in condition 4 above.

22. The State shall manage, maintain, preserve, and protect all currently identified significant objects, sites, or structures of archeological, historical, or architectural nature located on the premises at the approximate location shown colored in brown on Exhibit "A". Said significant objects, sites, or structures will be described and specific protective measures will be outlined in a plan to be jointly adopted by the State and the Corps of Engineers. The State shall immediately notify the District Engineer of all findings of objects, sites, or structures of archeological, historical, or architectural nature.

23. The State shall not cause harm or damage to any species or their critical habitats which have been classified as threatened or endangered pursuant to the Endangered Species Act of 1973 and amendments thereto; and the State shall immediately notify the District Engineer of all initial reported sightings of said threatened or endangered species.

24. The Government acquired an easement for construction, operation, and maintenance of roads at the location shown outlined in green on attached Exhibit "A". The State shall be responsible for operation and maintenance of these roads and all roads within the premises.

25. The State shall administer this lease in accordance with the provisions of Title 36, Code of Federal Regulations, Chapter 3, part 327.

Appendix B. (cont.) Lease with the state of North Carolina

IN WITNESS WHEREOF, I have hereunto set my hand by authority of the Secretary of the Army this 12th day of October, 1981.

Signed and sealed in the presence of:

Maria J. Lick

Jean A. Conner

My Commission Expires 14 Sept. 83.

James N. Ellis

JAMES N. ELLIS

Major General, USA

Commander and Division Engineer

THIS LEASE is also executed by the State this 7th day of October, 1981.

THE STATE OF NORTH CAROLINA

BY: James B. Hunt

TITLE: GOVERNOR

(SEAL)

Signed and sealed in the presence of:

James B. Hunt
Secretary of State

Appendix B. (cont.) Lease with the state of North Carolina

STATE OF GEORGIA }
COUNTY OF FULTON }

ACKNOWLEDGEMENT

I, Jean A. Conner, a Notary Public in
and for the County and State aforesaid, do hereby certify that
James N. Ellis personally appeared before me
this day and acknowledged the due execution of the foregoing instru-
ment by authority of the Secretary of the Army.

Witness my hand and official seal this the 12th day of
October, 1981.

Jean A. Conner
Notary Public

My Commission Expires:

14 September 1985

Appendix B. (cont.) Lease with the state of North Carolina

Revised 10 August 1981

DIVISION OF RESPONSIBILITIES
LEASE NO. DACW21-1-81-2603
B. EVERETT JORDAN LAKE

Responsible
Agency
Corps State

PLANNING AND DESIGN FUNCTION

1. Planning and Design Activities

Master Plan	PR	A
Feature DM's	PR	A
Plans and Specs	PR	A
Master Plan Updates	JR	JR
Consultant Selection	PR	A
Approval of MP	PR	A
Approval of DM's	PR	A
Approval of P&S	PR	A
Approval of MP Updates	PR	A
Approval of Subleases	A/M/r	PR

CONSTRUCTION FUNCTION (INITIAL WITH CORPS FUNDS)

2. Construction Activities

Project Construction	PR	A
Contract Administration	PR	A
Inspection	PR	A
Acceptance	PR	A
"As Built" Modify MP	PR	A

OPERATIONAL FUNCTION (OPERATIONS, MAINTENANCE, REPLACEMENT, AND REAL ESTATE)

3. Forest Management Activities (All Areas)

Forest Mgt. Plan Preparation	PR	A
Fire Suppression	A	PR
Incidental Tree Removal and Replacement	JR	JR
Major Tree Removal (Timber Harvesting)	A/M/r	PR
Reforestation	A/M/r	PR
FMP Execution	A/M/r	PR
Annual Work Plan	A/M/r	PR
Plan Approvals	PR	A
Reports	JR	JR

EXHIBIT "B"

Appendix B. (cont.) Lease with the state of North Carolina

	Responsible Agency	
	<u>Corps State</u>	
Const. Minor Fac. and Roads	PR	
Trash Collection	PR	
Maintain Reservoir Mgt. Fac.	PR	
Mowing	PR	
Maintain Piers and Bulkheads	PR	
Dam Operation	PR	
Dam Maintenance	PR	
Maintain or Replace Signs or Markers	PR	
Reports and Statistics	PR	
O&M Budget Preparation	PR	
12. Archeological and Historical Management	A/r	PR
13. Maintain Boat Launch Ramps		
(a) Recreational Sites		PR
(b) Operational Area/Not Included in Lease Premises	PR	
(c) Public Safety and Convenience		PR
14. Use Allocation of Reservoir Waters (Water Allocation Plan)	JR	JR
Use Allocation Enforcement		PR

CODE:

- PR - Primary Responsibility. The agency having primary responsibility is that agency accountable to insure that all functions of a given task are fully implemented. If the agency with secondary responsibility fails or declines to participate, the primary agency may complete the task unilaterally.
- JR - Joint Responsibility. Both agencies are equally accountable/responsible for the functions required to insure full implementation of a given task.
- A - Assist. Agency with "assist" responsibility will be provided an opportunity to participate in the activity of a given task prior to the finalization of the task. To "assist" should not automatically impose a monetary burden on the assisting agency. However, it is active participation upon request of the agency having primary responsibility.
- M - Monitor. To monitor is to remain aware of the activities comprising a given task to insure fulfillment of the other agency's responsibilities. This should not be interpreted to mean detailed inspection of activities on a regular schedule, but it is passive participation, without having to be requested, at the discretion of the monitoring agency.
- r - Review and Approve. This means to survey or inspect the document or instrument for accuracy and content with the power to veto/disapprove the document/action for cause.

Appendix B. (cont.) Lease with the state of North Carolina

ASSURANCE OF COMPLIANCE WITH THE DEPARTMENT OF DEFENSE DIRECTIVE UNDER TITLE VI OF THE CIVIL RIGHTS ACT OF 1964

State of North Carolina (hereinafter called "Applicant-Recipient")
(Name of Applicant-Recipient)

HEREBY AGREES THAT it will comply with title VI of the Civil Rights Act of 1964 (P.L. 88-352) and all requirements imposed by or pursuant to the Directive of the Department of Defense (32 CFR Part 300, issued as Department of Defense Directive 5500.11, December 28, 1964) issued pursuant to that title, to the end that, in accordance with title VI of that Act and the Directive, no person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant-Recipient receives Federal financial assistance from Department of
(Component of the

the Army and HEREBY GIVES ASSURANCE THAT it will immediately
(Department)
take any measures necessary to effectuate this agreement.

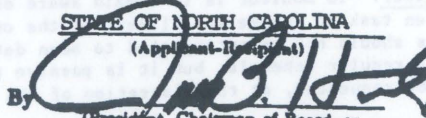
If any real property or structure thereon is provided or improved with the aid of Federal financial assistance extended to the Applicant-Recipient by this Department of the Army, assurance shall obligate the Applicant-Recipient, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant-Recipient for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant-Recipient for the period during which the Federal financial assistance is extended to it by Department of the Army.
(Component of the Department)

THIS ASSURANCE is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts, property, discounts or other Federal financial assistance extended after the date hereof to the Applicant-Recipient by the Department, including installment payments after such date on account of arrangements for Federal financial assistance which were approved before such date. The Applicant-Recipient recognizes and agrees that such Federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant-Recipient, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Applicant-Recipient.

Dated 10/7/81

STATE OF NORTH CAROLINA
(Applicant-Recipient)

By


(President, Chairman of Board, or
comparable authorized official)

Secretary, NRCD

P.O. Box 27687

Raleigh N.C. 27611

Appendix B. (cont.) Lease with the state of North Carolina

		Responsible Agency	
		Corps	State
4.	Mosquito Control Activities (All Lands)		
	Mosquito Control Plan	PR	A/M
	Drainage Improvements (Initial)	PR	A/M
	Drainage Improvements (Future)	PR	A/M
	Mosquito Control Plan	PR	A
	MCP Approval	PR	r
	Annual Reports	PR	A
5.	Water Quality Control Activities (All Lands)		
	Monitoring Water Quality in Impoundment	A/M/r	PR
6.	Encroachments (All Lands) Boundary Lines		
	Boundary Inspections	PR	A
	Appraisals of Timber Encroachments	PR	A
	Surveying of Building Encroachments	PR	
	Periodic Reestab. and Remarking Boundary	PR	
	Reporting of Encroachments	PR	A
	Encroachment Prevention Program	PR	A/M
	Resolution of Encroachments	PR	A
7.	Fish and Wildlife Activities (All Lands)		
	Devel. F&WL Mgt. Plan	PR	A
	Endangered Species Mgt.	PR	A
	F&WL Mgt. Plan Execution	A/M/r	PR
	Devel. Annual Work Plan	A/M/r	PR
	Reports	A/M/r	PR
8.	Shoreline Maintenance (Developed Recreation Areas)		
	Periodic Removal of Driftwood and Debris	M	PR*
	Rebrushing	M	PR*
	Stump Removal	M	PR*
	Control of Major Erosion	PR	M

*After 2 full years of impoundment.

Appendix B. (cont.) Lease with the state of North Carolina

	Responsible Agency	
	Corps	State
8A. Shoreline Maintenance (All Other Areas)		
Periodic Removal of Driftwood and Debris	PR	A/M
Rebrushing	PR	A/M
Stump Removal	PR	A/M
Control of Erosion	PR	A/M
9. Safety Administration (All Areas Except Damsite)		
Prepare Safety Plan	A/M/r	PR
Water Safety Education	A/M/r	PR
Patrol Waters	A/M/r	PR
Maintain Swim Areas	A/M/r	PR
Provide Lifeguard Service (at designated swim areas)	A/M/r	PR
Monitor and Correct Safety Hazards on Lands	A/M/r	PR
Reports	A/M/r	PR
10. Recreation Site Management Activities		
Maintain and/or Replace Roads	A/M/r	PR
Maintain and/or Replace Rec. Facilities	A/M/r	PR
Trash Collection	A/M/r	PR
Maintain Toilet and Shower Buildings	A/M/r	PR
Mowing	A/M/r	PR
Maintain Structures Adaptable to Project Use	A/M/r	PR
Maintain Piers and Bulkheads	A/M/r	PR
Visitor Centers and Personnel	A/M/r	PR
Maintain Visitor Centers	A/M/r	PR
Visitor Control	A/M/r	PR
Law Enforcement	A/M/r	PR
Maintain Water Supply Sources	A/M/r	PR
Maintain or Monitor Wastewater Treatment	A/M/r	PR
Maintain or Replace Signs, Markers, and Buoys	A/M/r	PR
Reports and Statistics of Rec. Use and Costs	A/M/r	PR
11. Land Management Activities (Damsite Area Not Included in Lease Premises)		
Maintain or Replace Roads	PR	

Appendix C. Land Use Request

Wilmington District Land Use Request Model A 5-Step Q&A Process

Step 1: Understand the purpose for the Land Use Request.

- Q: What will the land be used for?
- Q: Is the proposed land use consistent with District, Natural Resources Management and real estate policies?
- Q: Is the proposed land use consistent with the project's authorized purposes.?
- Q: Who are the sponsors and beneficiaries of the proposed land use?
- Q: Is the request consistent with easement estates?

Step 2: Identify potential impacts of the Land Use Request.

- Q: What public and private benefits would result from the proposed land use?
- Q: What are the potential negative impacts to the environment, flood storage, recreation, etc.?
- Q: Does the proposed land use solve or create problems?
- Q: Will the Corps or the project benefit from the proposed land use?
- Q: What is the scope of the proposed land use?
- Q: What is the severity of the impacts?
- Q: What are the cumulative impacts if similar requests are made?
- Q: Would approving the request set a precedent or stray from established protocols?
- Q: What are the implications for other projects or other Districts?
- Q: Do elected officials support the Land Use Request?

Step 3: Explore alternatives for the Land Use Request to avoid public lands or detriment impacts.

- Q: Are non-public lands available and appropriate for the proposed land use"
- Q: What can be done to accomplish the purpose of the Land Use Request and avoid all negative impacts?
- Q: What alternatives would avoid one or more negative impacts?

Step 4: Try to minimize use of public lands and negative impacts.

- Q: Can the Land Use Request be modified to reduce the scope or severity of negative impacts?
- Q: Can special conditions, considerations or requirements be incorporated into the proposed land use to reduce negative impacts?

Step 5: Determine what mitigation/compensation to public lands will be required of the Land Use Request sponsor.

- Q: What can be done to make the project whole in terms of services, programs and access to the public.
- Q: What is the market value of the land?
- Q: Does the mitigation/compensation specifically address and resolve unavoidable negative impacts?
- Q: Is the mitigation/compensation plan consistent with Corps policies and regulations?

Appendix D. Acronyms

ATT	American Tobacco Trail
COE	Corps of Engineers
c.f.s.	Cubic Feet Per Second
GIS	Geographic Information System
m.g.d.	Million Gallons Per Day
m.s.l.	Mean Sea Level
MP	Master Plan
MOU	Memorandum of Understanding
NCCGIA	North Carolina Center for Geographic Information and Analysis
NCDOT	North Carolina Department of Transportation
NCDENR	North Carolina Department Of Environment and Natural Resources
NCWRC	North Carolina Wildlife Resources Commission
NCDPR	North Carolina Division of Parks and Recreation
NCDFR	North Carolina Division of Forest Resources
NEPA	National Environmental Policy Act
NHP	National Heritage Program
NRCS	National Resources Conservation Service
OMP	Operational Management Plan
P.L.	Public Law
PWC	Personal Watercraft
RV	Recreational Vehicle
SCORP	State Comprehensive Outdoor Recreation Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
VERS	Visitor Uses Estimation and Reporting System

Appendix E. Coordination

Attendance at Agency Coordination Meetings

1. December 1, 1994:

Personnel from USACE Jordan Lake
Personnel from USACE, Wilmington District Office

2. February 24, 1995:

NC Department of Parks and Recreation (NCDPR)
USACE Falls Lake
USACE Natural Resources Management
USACE Environmental Resources
USACE Project Management
NC Wildlife Resources Commission
NCDPR Jordan Lake SRA
NCDPR Falls Lake SRA
NC Division of Archives and History
NC Division of Water Resources
USACE Environmental Resources
USACE Jordan Lake

3. May 26, 1995:

USACE Environmental Resources
USACE Jordan Lake
USACE Special Studies
NC Wildlife Resources Commission
NC Department Parks and Recreation
NC Department Forest Resources
USACE Falls Lake

Appendix E. Coordination (cont.)

USACE Natural Resources Management
NC Division of Archives and History

4. December 11, 1995:

NC Department Parks and Recreation
NC Division of Cultural Resources
USACE Special Studies
USACE Natural Resources Management
USACE Environmental Resources
USACE Jordan Lake
USACE Falls Lake
NC Wildlife Resources Commission
NC Department Forest Resources

5. January 25, 1996:

Durham City/County Planning Dept.
USACE Falls Lake
USACE Jordan Lake
USACE Environmental Resources

6. April 9, 1996:

USACE Environmental Resources
USACE Natural Resources Management
USACE Jordan Lake
USACE Falls/Jordan
USACE Special Studies
NC Department Parks and Recreation

Appendix E. Coordination (cont.)

UPDATE OF THE B. EVERETT JORDAN DAM AND LAKE MASTER PLAN

The Wilmington District, U. S. Army Corps of Engineers is currently updating the *Master Plan for the Development, Use and Management of B. Everett Jordan Dam and Lake, North Carolina*. This study will revise the original master plan which was approved in October 1982.

The Master Plan is the basic document guiding cooperative involvement of Federal, State, and local governments in a multiple purpose project. It guides both the initial development of the project in accordance with its originally authorized purposes, and the long term management and stewardship of project resources for the benefit of present and future generations.

The Master Plan covers broad issues affecting the use and management of project resources. It identifies needs and concerns of the public and the agencies managing the project. Alternative methods of addressing these concerns are analyzed and weighed against the project's environmental capabilities. Solutions are recommended and priorities established. Typically, these issues include recreation opportunities, protection of cultural resources, and natural resources management.

Updates to the master plan are required as conditions and public needs change over time. The update considers the current status of the project in terms of its physical development; provides an analysis of how well the project works according to its original design and purpose; and looks at issues, requirements, and constraints that will affect future planning, use, and operation of the project.

This update will not change the basic project purposes as authorized by the Flood Control Act of 1963 (Public Law 88-253). These purposes include flood control, water quality control, water supply, stream flow regulation, recreation, and fish and wildlife enhancement.

In developing this update, one of the primary considerations is meeting the long term needs of the public. Therefore, the public is invited to send their comments and ideas concerning the long term use and development of B. Everett Jordan Dam and Lake, by August 21, 1995, to:

Commander, U. S. Army Engineer District, Wilmington
P.O. Box 1890
Wilmington, NC 28402-1890

Telephone: 910-251-4906

Appendix E. Coordination (cont.)

CESAW-CO-RJ 12 July 1995

MEMORANDUM FOR CESAW-PD-S/Mike Annand

SUBJECT: Mailing List for Jordan Lake Master Plan Update

1. The following addresses are furnished as requested:

Superintendent
N. C. Division of Parks & Recreation
Jordan Lake State Recreation Areas
Route 2, Box 159
Apex, NC 27502

Manager
Crosswinds Marina
Route 2, Box 159-A
Apex, NC 27502

Director of Planning, Chatham County
PO Box 54
Pittsboro, NC 27312

Director of Planning, Wake County
PO Box 550
Raleigh, NC 27602

Director of Planning, Orange County
PO Box 8181
Hillsborough, NC 27278

Director of Planning
Durham County and City
101 City Hall Plaza
Durham, NC 27701

Carolina Canoe Club
416 Robin Hood Drive
Raleigh, NC 27604

Jerry Turner & Associates, Inc.
905 Jones Franklin Road
Raleigh, NC 27606

Jordan Lake Safety Council
PO Box 144
Moncure, NC 27559

Appendix E. Coordination (cont.)

Mailing List Cont'd

Page 2 of 6

Chairman

Jordan Lake State Parks Advisory Council
Route 1, Box 107
Beaver Creek Road
New Hill, NC 27562

The Chatham Record
PO Box 458
Pittsboro, NC 27312

The Sanford Herald
PO Box 100
Sanford, NC 27330

The Apex Herald
PO Box 1539
Apex, NC 27502

Director
Division of Water Resources
NC Dept of Natural Resources
Community Development
PO Box 27687
Raleigh, NC 27611

N. C. Forest Service
Jordan Lake Office
1225 Big Woods Road
Chapel Hill, NC 27514

Field Supervisor
US Fish & Wildlife Service
US Dept of the Interior
PO Box 25039
Raleigh, NC 27611-5039

Environmental Review Coordinator
State Historic Preservation office
NC Dept of Cultural Resources
109 East Jones Street
Raleigh, NC 27611

NC Dept of Natural Resources
& Community Development
Division of Forest Resources
512 N. Salisbury Street
Raleigh, NC 27611-7687

Appendix E. Coordination (cont.)

Mailing List Cont'd

Page 3 of 6

Orange Water & Sewer Authority
PO Box 3GG
Carrboro, NC 27510

Chatham Trails Committee
c/o Dee Dee Curry
1104 Sourwood Circle
Chapel Hill, NC 27514

Triangle Greenways Council
c/o Larkin Kirkman
PO Box 274G
Raleigh, NC 27602

Capitol City Rotary Club
c/o Ed Warner
2714 Dunhaven Drive
Garner, NC 27529

Triangle Land Conservancy
PO Box 13031
Research Triangle Park, NC 27709-3031
Audubon Council of NC
c/o Ed Harrison
58 Newton Drive
Durham, NC 27707-9744

Conservation Council
PO Box 37564
Raleigh, NC 27627

Clean Water Fund of NC
PO Box 1008
Raleigh, NC 27602

Conservation Fund - Southeast Regional Office
PO Box 374
Chapel Hill, NC 27514

Conservation Trust for NC
PO Box 33333
Raleigh, NC 27636

Ducks Unlimited - South Atlantic Flyway
Regional Field Operations
Route 6, Box 559
Clinton, NC 28328

Appendix E. Coordination (cont.)

Mailing List Cont'd
Page 4 of 6

Eno River Association
4015 Cole Mile Road
Durham, NC 27705

NC Environmental Defense Fund
128 E. Hargett St., Ste. 202
Raleigh, NC 27601

Friends of State Parks
309 W. 3rd Ave., No. 2D
Lexington, NC 27292

Haw River Assembly
PO Box 187
Bynum, NC 27228

Land Stewardship Council
PO Box 25716
Raleigh, NC 27611-5716

The Nature Conservancy - NC Chapter
Carr Mill Ste. 12D
Carrboro, NC 27510

Neuse River Foundation
PO Box 15451
New Bern, NC 28561

NC Rail - Trails
703 Ninth St., Ste 124
Durham, NC 27705

Sierra Club - NC Chapter
1022 Washington Street
Raleigh, NC 27605

Triangle Rails to Trails Conservancy
703 Ninth St., Ste. 123
Durham, NC 27705

NC Fats Mountain Bike Club
PO Box 37728
Raleigh, NC 27627

NC Wildlife Federation
1022 Washington Street
Raleigh, NC 27605

Appendix E. Coordination (cont.)

Mailing List Cont'd
Page 5 of 6

NC Horse Council
PO Box 25871
Raleigh, NC 27611

NC Recreation and Parks Society
436 N. Harrington Street
Raleigh, NC 27603

NC Trails Association
PO Box 575
Winston-Salem, NC 27102

NC Botanical Garden
Campus Box 3375, Totten Center
UNC
Chapel Hill, NC 27599-3375

NC Museum of Natural Sciences
102 N. Salisbury Street
Raleigh, NC 27603

Quail Unlimited
PO Box 1110
Stuart, VA 24171

NC Chapter, The Wildlife Society
1394 Utah Mountain Drive
Waynesville, NC 28786

NC Chapter, American Fisheries Society
Route 6, Box 213
Mooresville, NC 28115

NC B.A.S.S. Federation
1105 Misty Wood Lane
Harrisburg, NC 28075

Director of Planning
City of Cary
PO Box 8005
Cary, NC 27512-8005

Appendix E. Coordination (cont.)

Mailing List Cont'd
Page 6 of 6

2. Point of contact for this action is at
619/542-4501.

Resource Manager

Appendix F. References

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Cable John S. 1981. Excavations at 31Ch366: Report of Findings, Resource Assessment and Recommendations. Prepared by Commonwealth Associates, Inc. Jackson, Michigan for U.S. Army Corps of Engineers, Wilmington District.

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Coe, Joffre L. 1965. Appraisal of the Archaeological Resources of the New Hope Reservoir, North Carolina. Research Laboratories of Anthropology, Chapel Hill, North Carolina.

Coe, Joffre L. 1978. Recommendations for further research. Unpublished manuscript on file, U.S. Army Corps of Engineers, Wilmington District.

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Division of Parks and Recreation, North Carolina Department of Environment and Natural Resources. 1998. Draft Jordan Lake State Recreation Area General Management Plan.

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Lewis, Richard H. 1988. Shadows From the Past... Twenty five Years of Archaeological and Historical Investigations at the B. Everett Jordan Lake Project, Chatham and Durham Counties, North Carolina.

Mueller, J. W., S. R. Claggett, J. S. Cable and C. E. Larsen. 1979. Report of Phase I Investigations and a Proposed Mitigation Plan for Sites 31Ch8, 31Ch28, and 31Ch29, B. E. Jordan Dam and Lake, Chatham County, North Carolina. Prepared by Commonwealth Associates, Inc. Jackson, Michigan for U.S. Army Corps of Engineers, Wilmington District.

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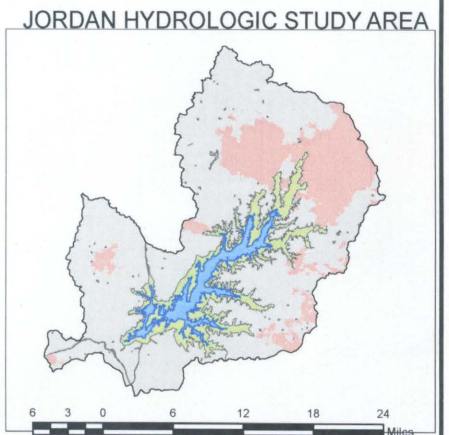
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B. EVERETT JORDAN DAM AND LAKE

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MASTER PLAN UPDATE

Map Portfolio



B. EVERETT JORDAN DAM AND LAKE

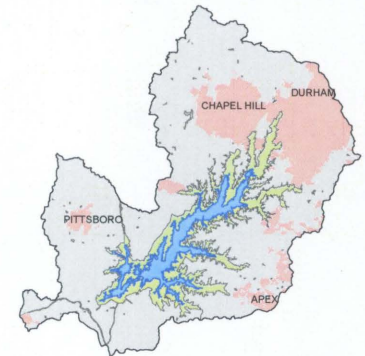
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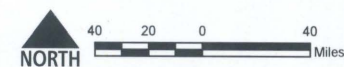
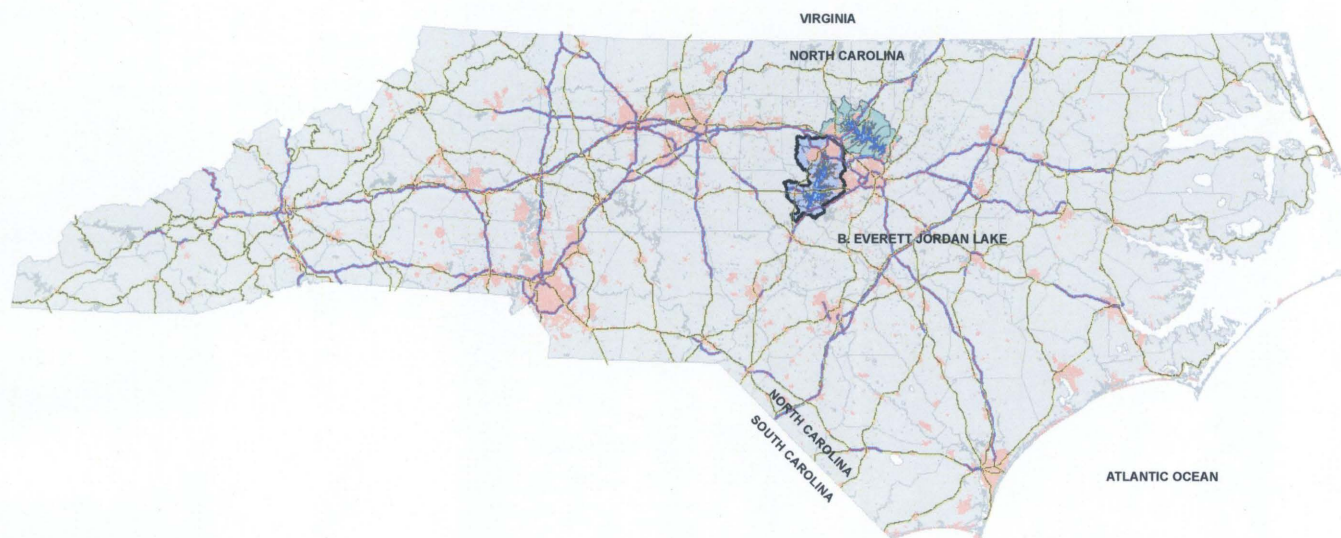
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- 30 OPERATIONAL MANAGEMENT PLAN

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COORDINATING OFFICIAL	_____
SUBMITTED	_____
RECOMMENDED	_____
APPROVED	_____
APPROVED	_____
DATE	_____

-  Interstates, Expressways, Parkways
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-  Jordan Lake Pool Elev. 216ft msl
-  Falls Lake Pool Elev. 250 msl
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-  Falls Project Land
-  NC Places
-  Jordan Study Basin
-  Falls Study Basin

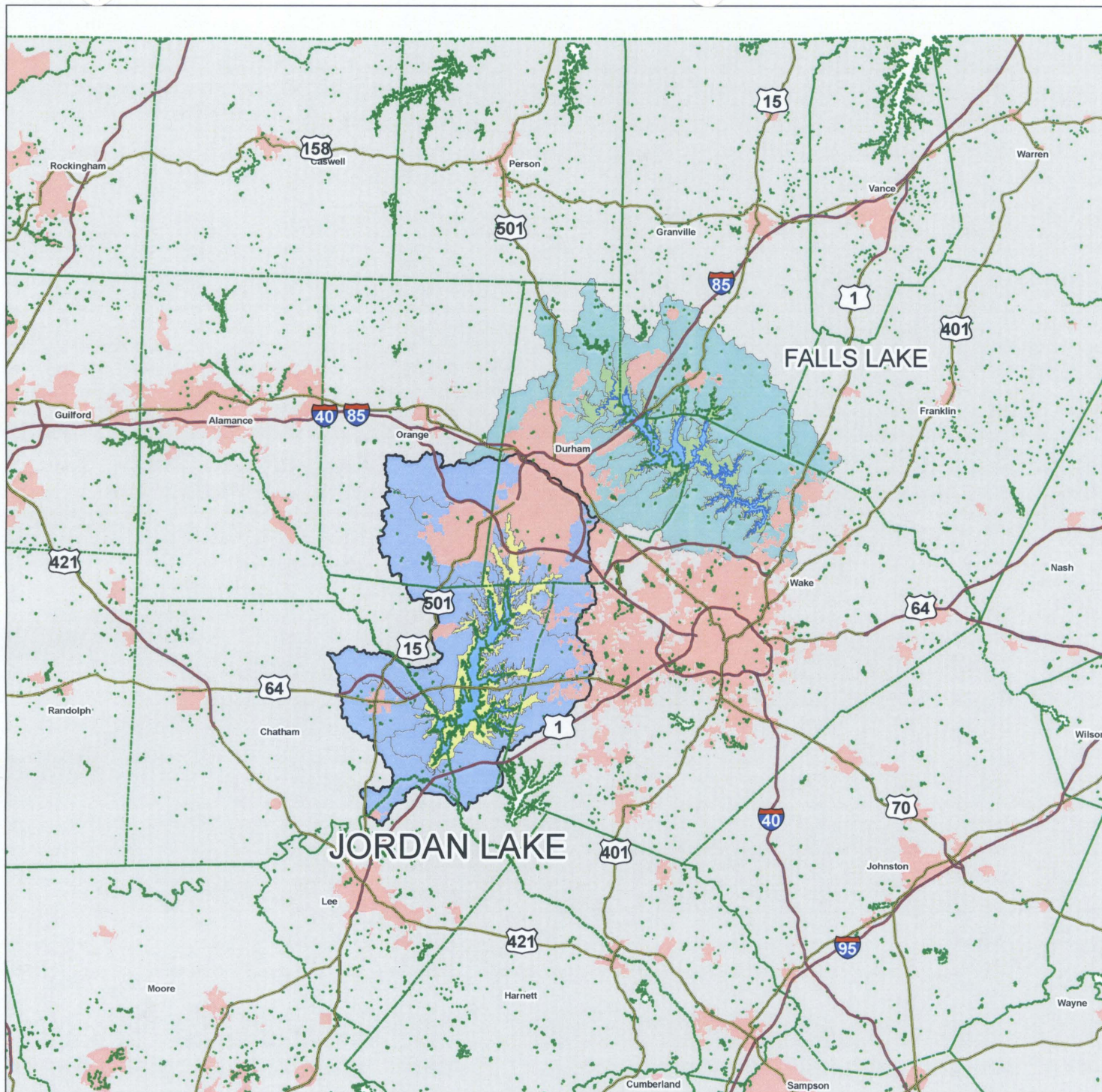


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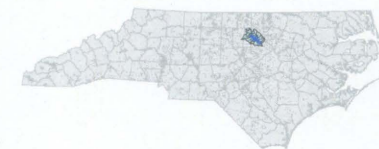
PROJECT LOCATION

DRAWING NO.	1	DATE	19 JUL 07	SHEET NO.	1
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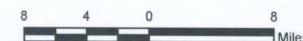


VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
- Counties
- Jordan Lake Pool Elev. 216ft msl
- Falls Lake Pool Elev. 250ft msl
- Jordan Project Land
- Falls Project Land
- NC Places
- Jordan Study Basin
- Falls Study Basin

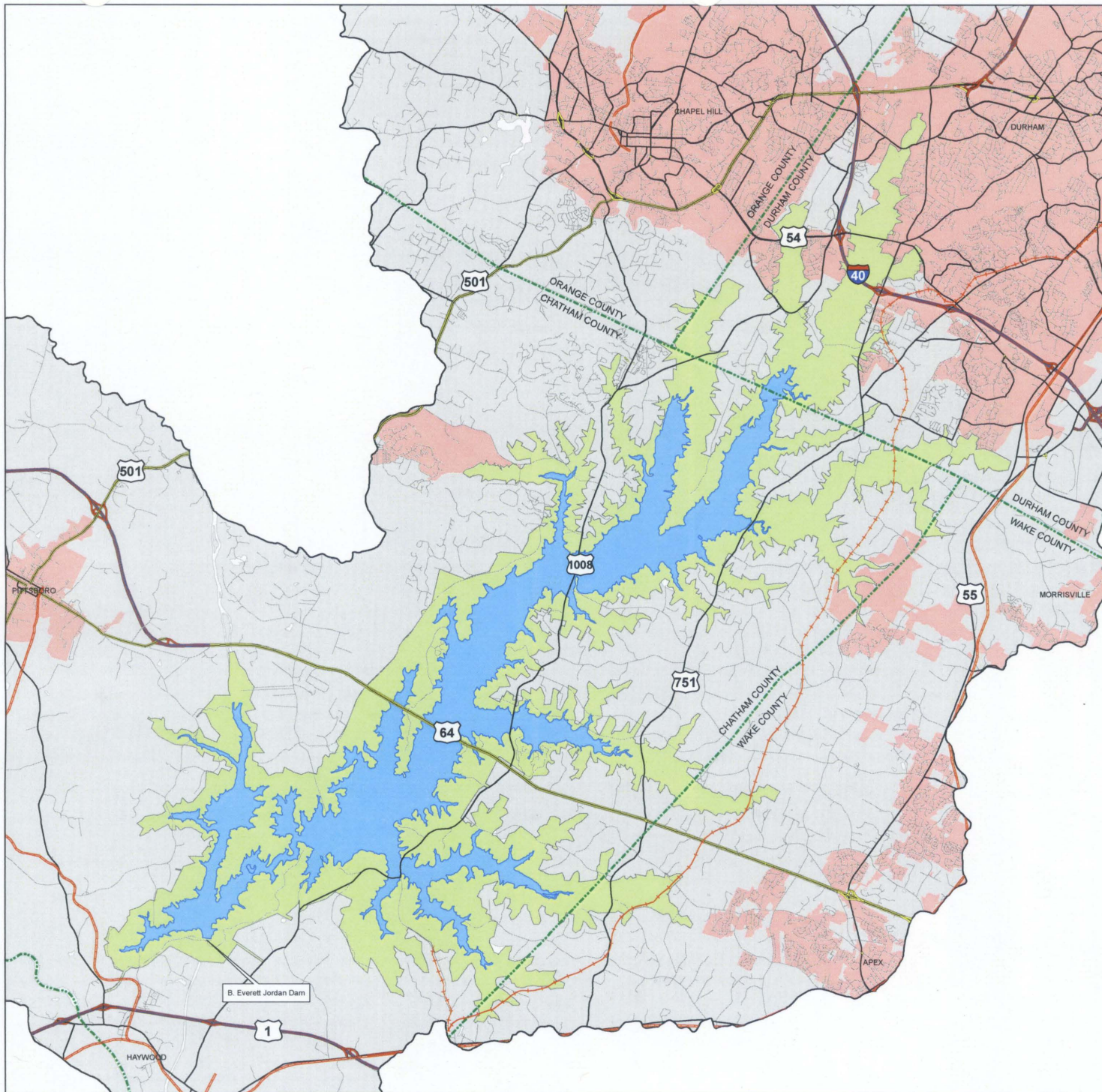


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PROJECT VICINITY

DRAWING NO. 2 DATE 19 JUL 07 SHEET NO. 4



VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
- State Hwys Major Thoroughfares
- County Line
- Abandoned Line
- Active Commercial Line
- Active Recreational Line
- Lake Pool Elev. 216ft msl
- Basin Boundary
- Project Land
- City Limits

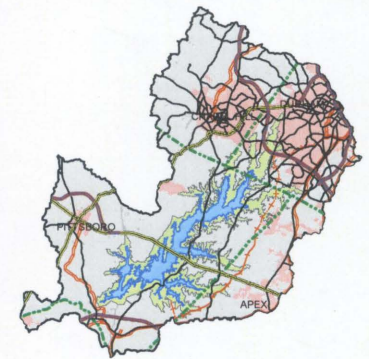


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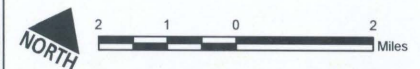
B. E. JORDAN DAM AND LAKE
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PROJECT LEVEL

VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
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- Abandoned Line
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- DEVELOPED RECREATION AREAS
- OTHER PROJECT LANDS

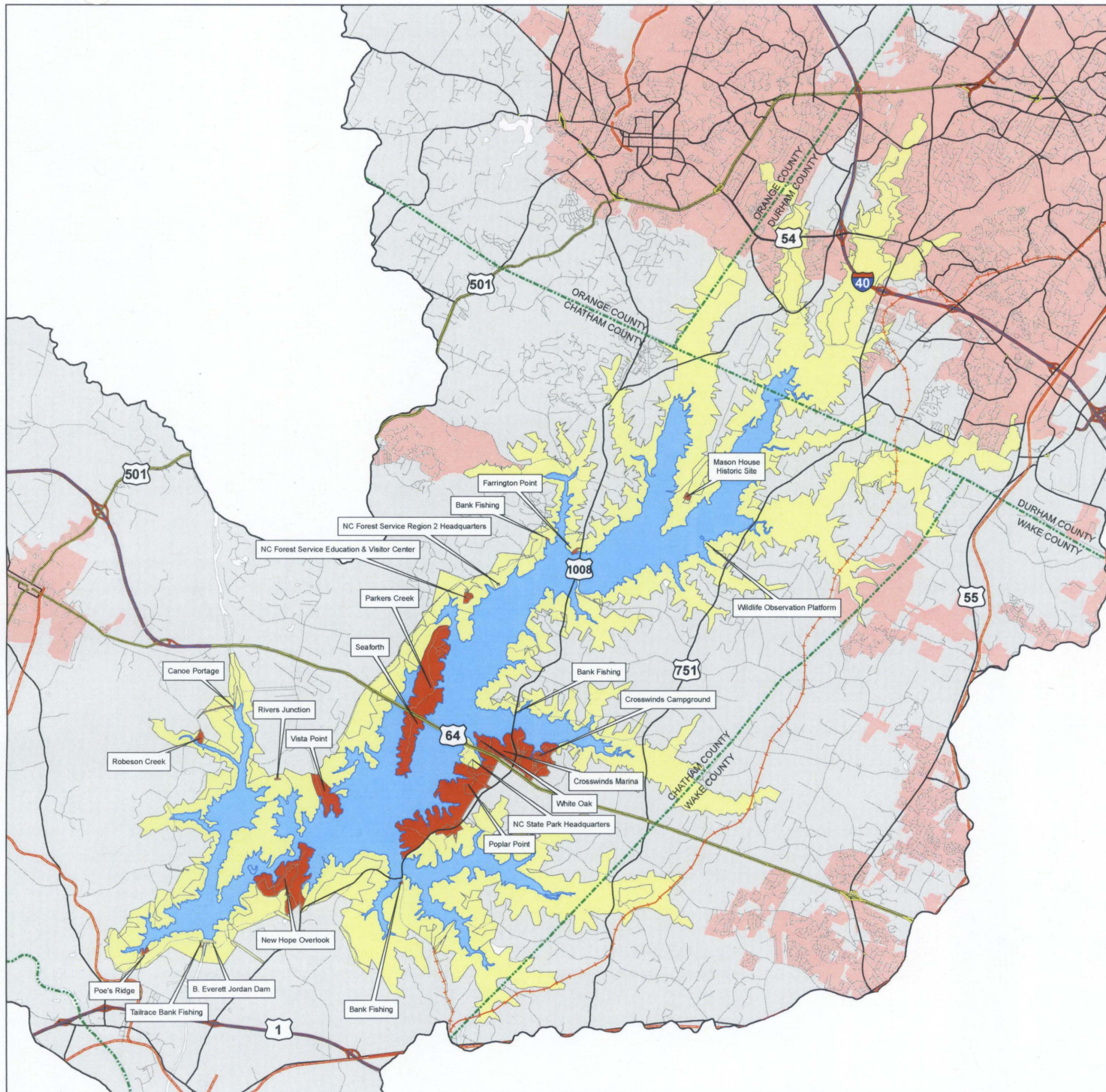


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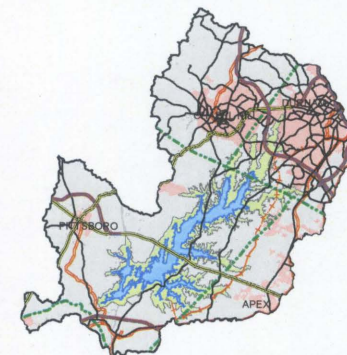
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RECREATION

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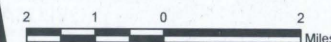
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- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
- State Hwys Major Thoroughfares
- County Line
- Abandoned Line
- Active Commercial Line
- Active Recreational Line
- Lake Pool Elev. 216ft msl
- City Limits

Basin Boundary

ALTAVISTA	RIVERVIEW	GRANVILLE
AUGUSTA	ROANOKE	GULLIED LAND
BADIN	STATE	HELENA
CARBONTON	UDORTENTS	HERNDON
CARTECAY	URBAN LAND	IREDELL
CECIL	WAHEE	MASADA
CHEWACLA	WEDOWEE	MAYODAN
OLD	WEHADKEE	NASON
CONGAREE	WHITE STORE	PEAWICK
CREEDMOOR	WICKHAM	PINKSTON
FACEVILLE	WILKES	PITS
GEORGEVILLE	WORSHAM	
GOLDSTON	ZION	



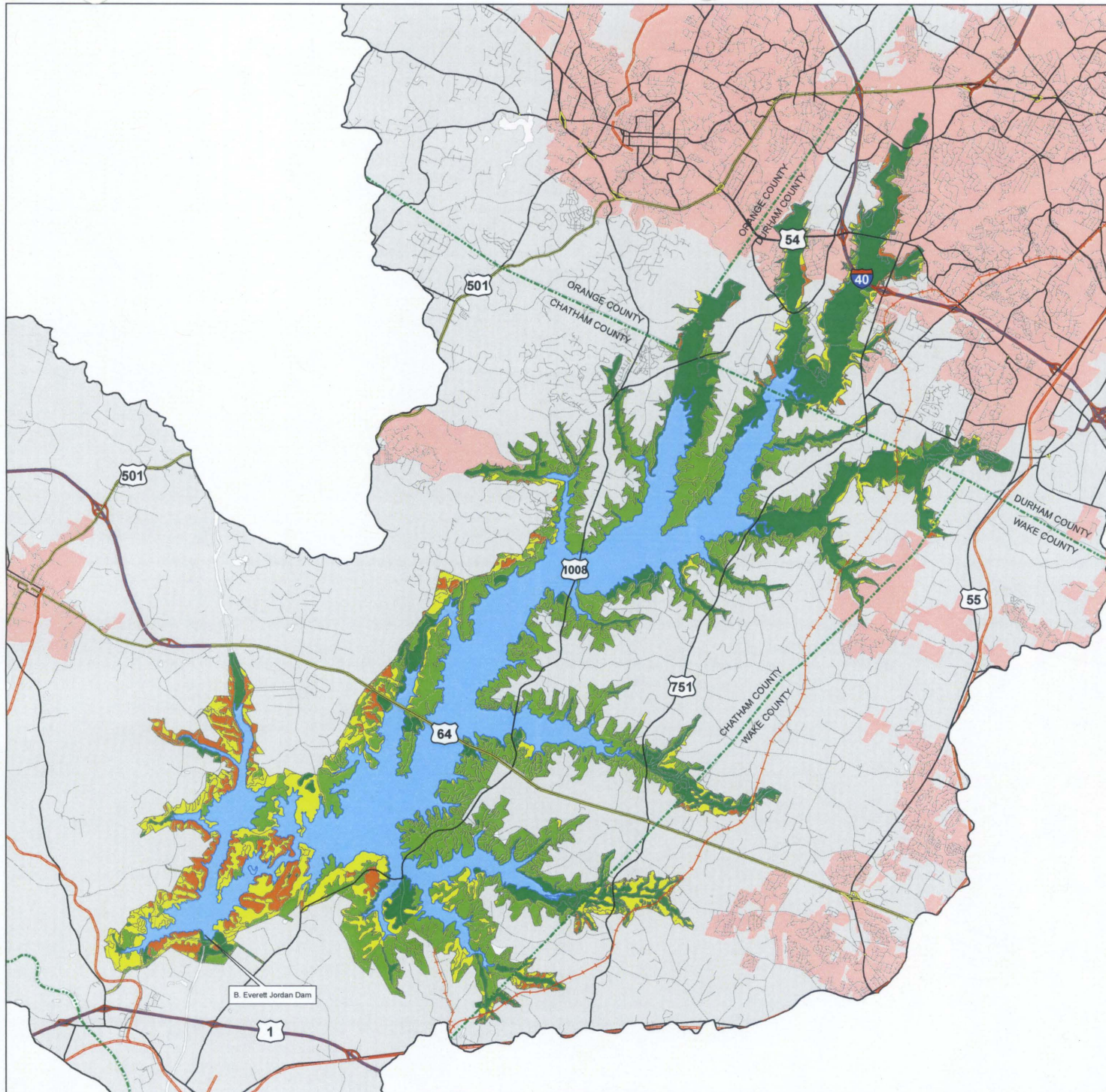
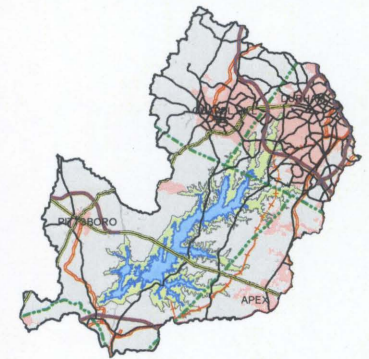
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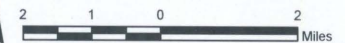
GENERAL SOILS

VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



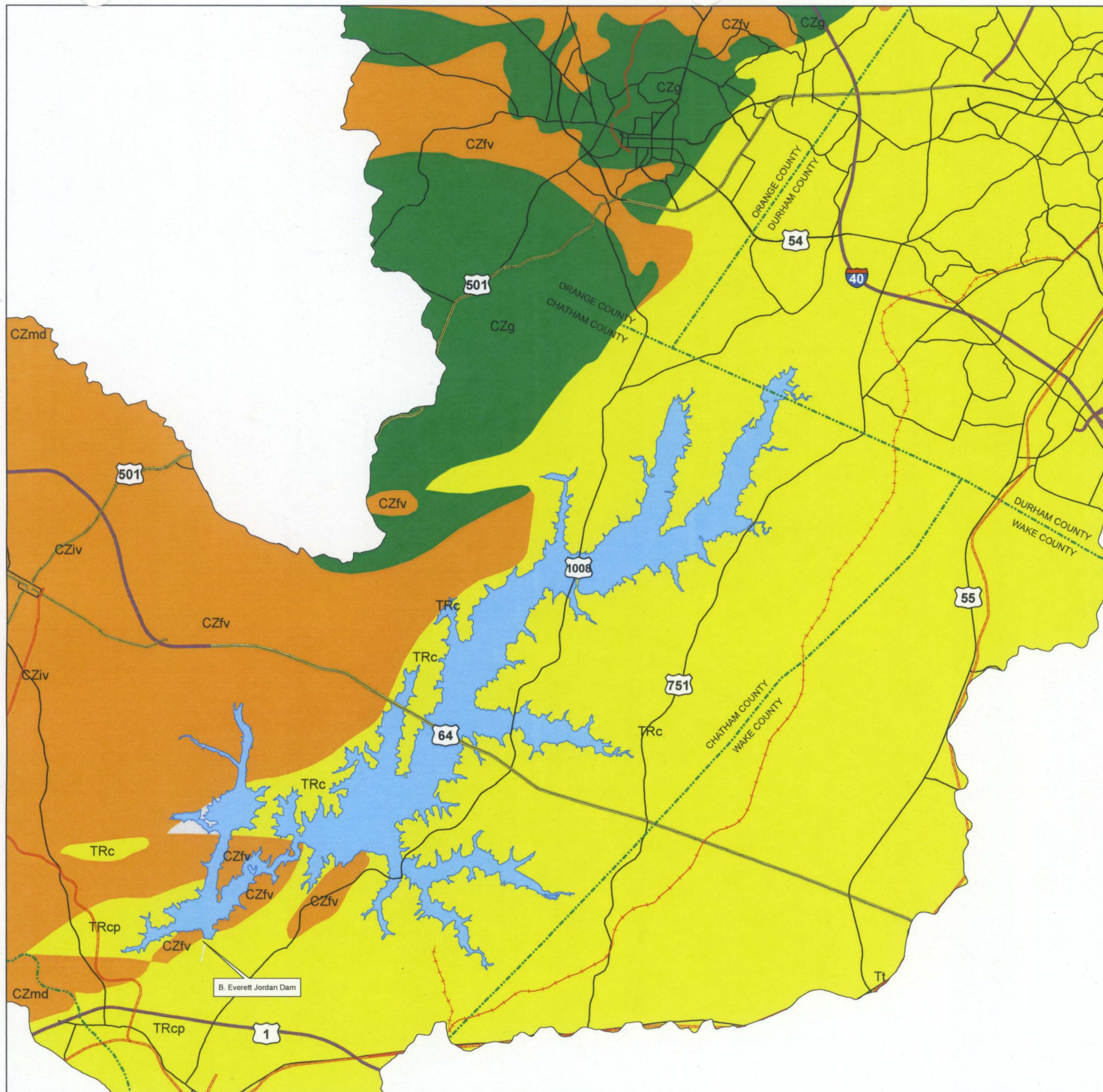
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- Active Commercial Line
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- City Limits
- Basin Boundary
- FLAT 0-2%
- GENTLE 3-6%
- MODERATE 7-15%
- STEEP 16-25%
- VERY STEEP 26+%



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B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

SLOPE ANALYSIS



VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
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- Abandoned Line
- Active Commercial Line
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- Lake Pool Elev. 216ft msl
- City Limits

Basin Boundary

SEDIMENTARY ROCKS

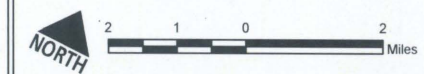
- Tt - Terrace Deposits and Upland Sediments
- TRc - Chatham Group Undivided
- TRcp - Pekin Formation

METAMORPHIC ROCKS

- CZiv - Intermediate Metavolcanic Rock
- CZfv - Felsic Metavolcanic Rock
- CZmd - Metamudstone and Meta-Argillite

INTRUSIVE ROCKS

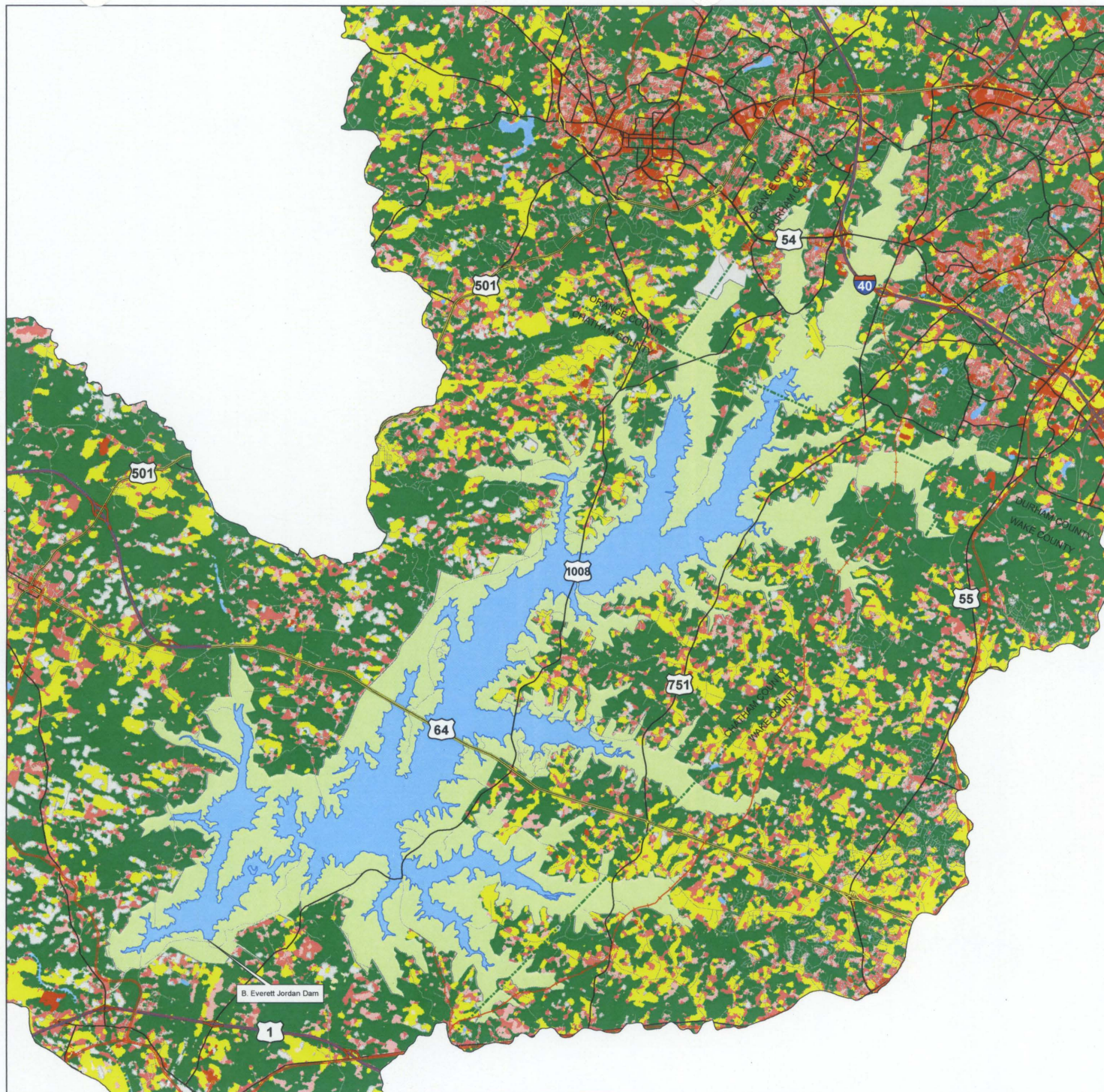
- CZg - Metamorphosed Granitic Rock



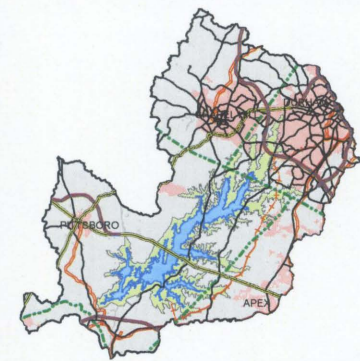
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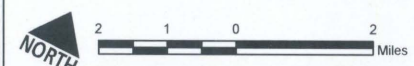
GEOLOGY



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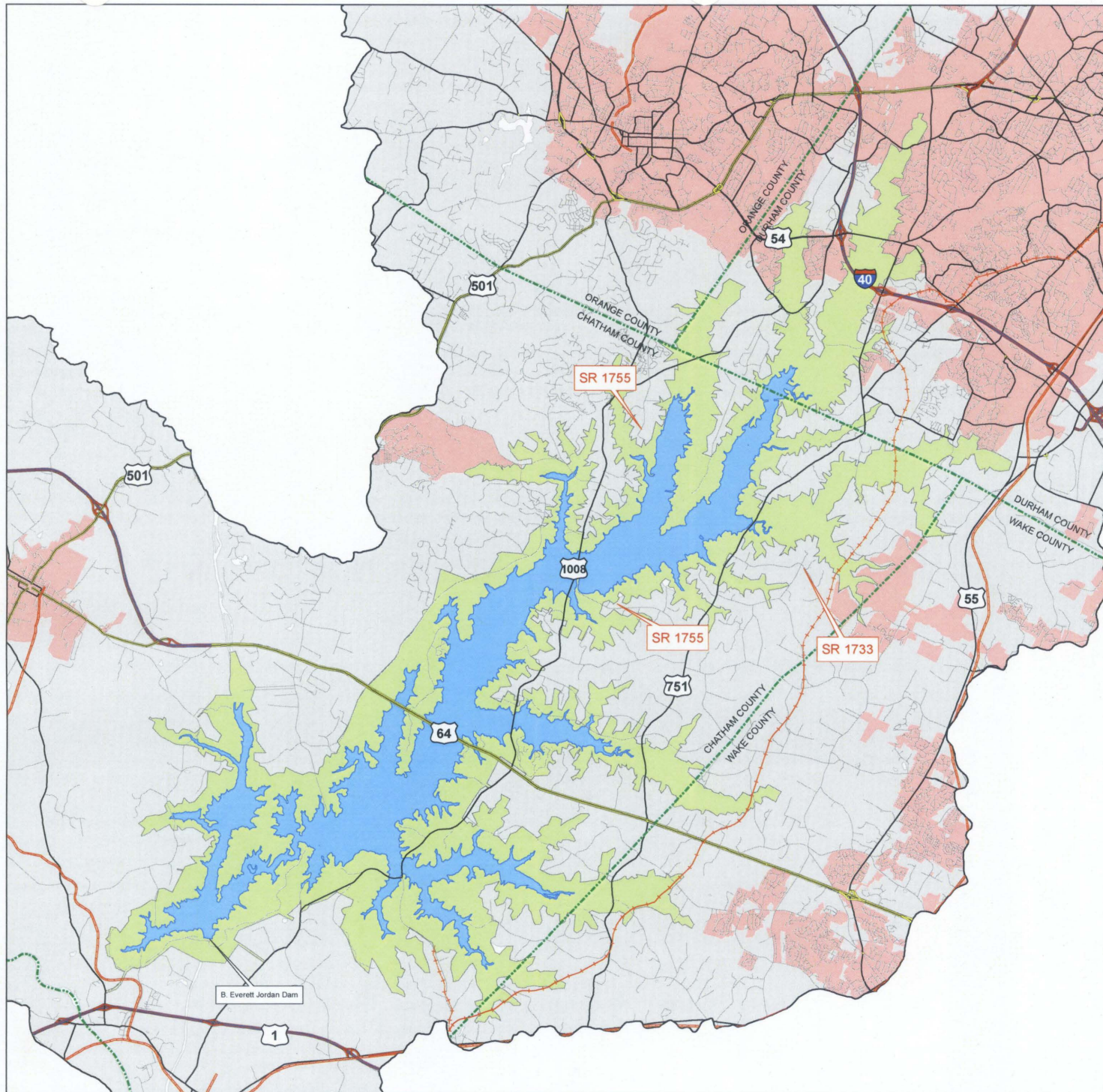
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- Active Recreational Line
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- City Limits
- Basin Boundary
- WATER
- FORESTED
- DISTURBED LAND
- AGRICULTURE
- LOW DENSITY DEVELOPMENT
- MEDIUM DENSITY DEVELOPMENT
- HIGH DENSITY DEVELOPMENT
- NO DATA



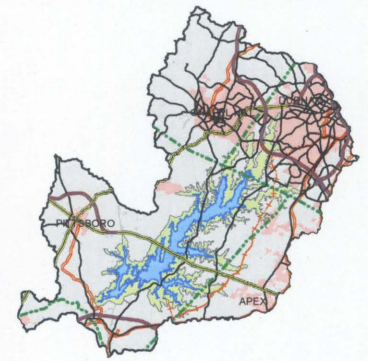
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MASTER PLAN UPDATE

LAND USE LAND COVER



VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



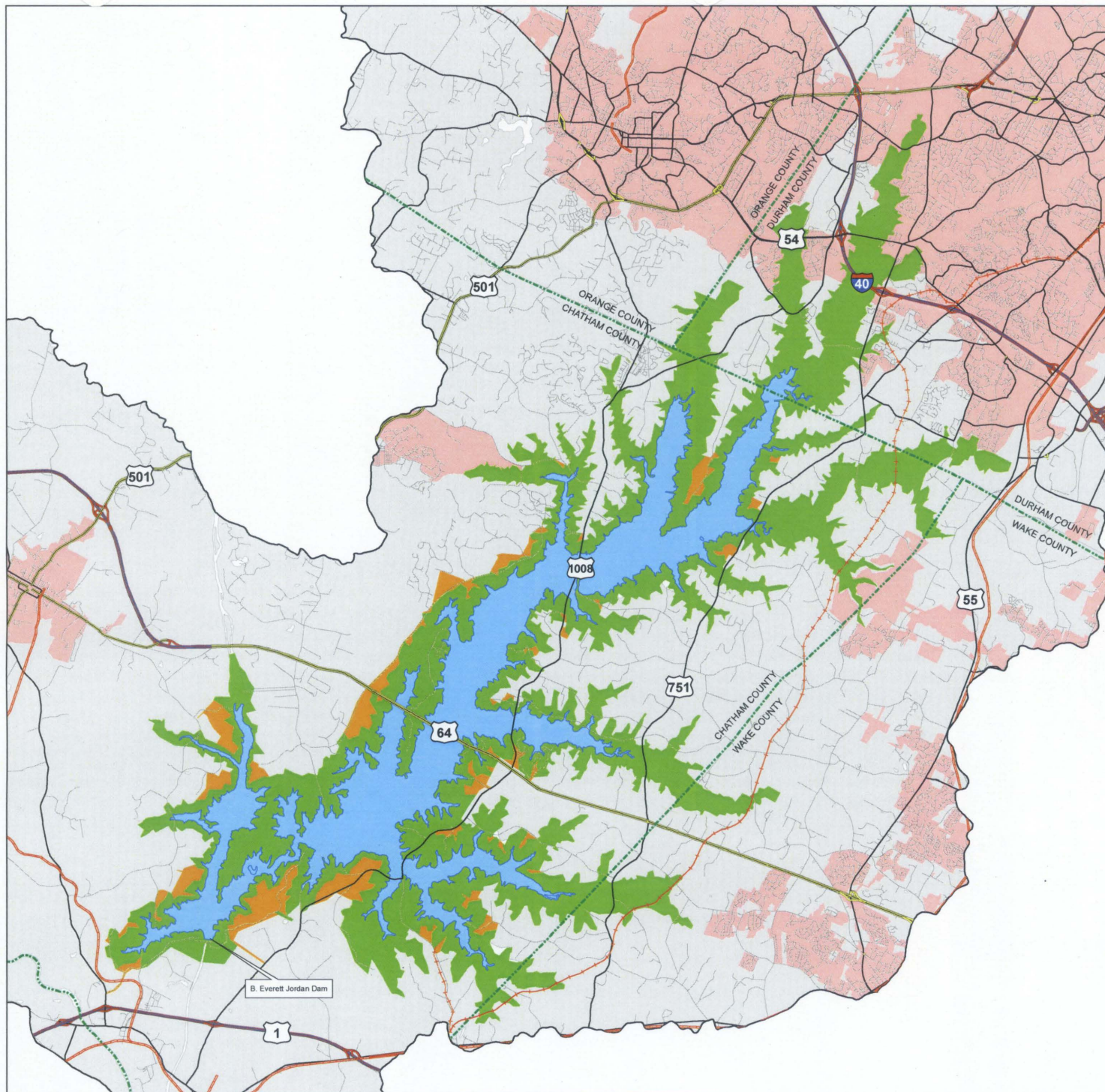
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- City Limits
- Basin Boundary
- Management Access Needs



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MASTER PLAN UPDATE

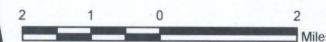
MANAGEMENT ACCESS NEEDS



VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
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- State Hwys Major Thoroughfares
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- Abandoned Line
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- OPERATIONS LAND
- SEPARABLE RECREATION LAND



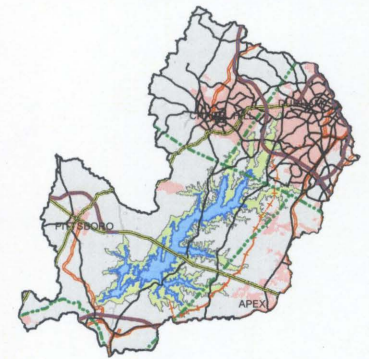
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MASTER PLAN UPDATE

LAND ALLOCATION

VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



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- State Hwys Major Thoroughfares
- County Line
- Abandoned Line
- Active Commercial Line
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- Lake Pool Elev. 216ft msl
- City Limits
- Basin Boundary
- PROJECT OPERATIONS
- RECREATION
- EASEMENT LANDS
- MULTIPLE RESOURCE MANAGEMENT



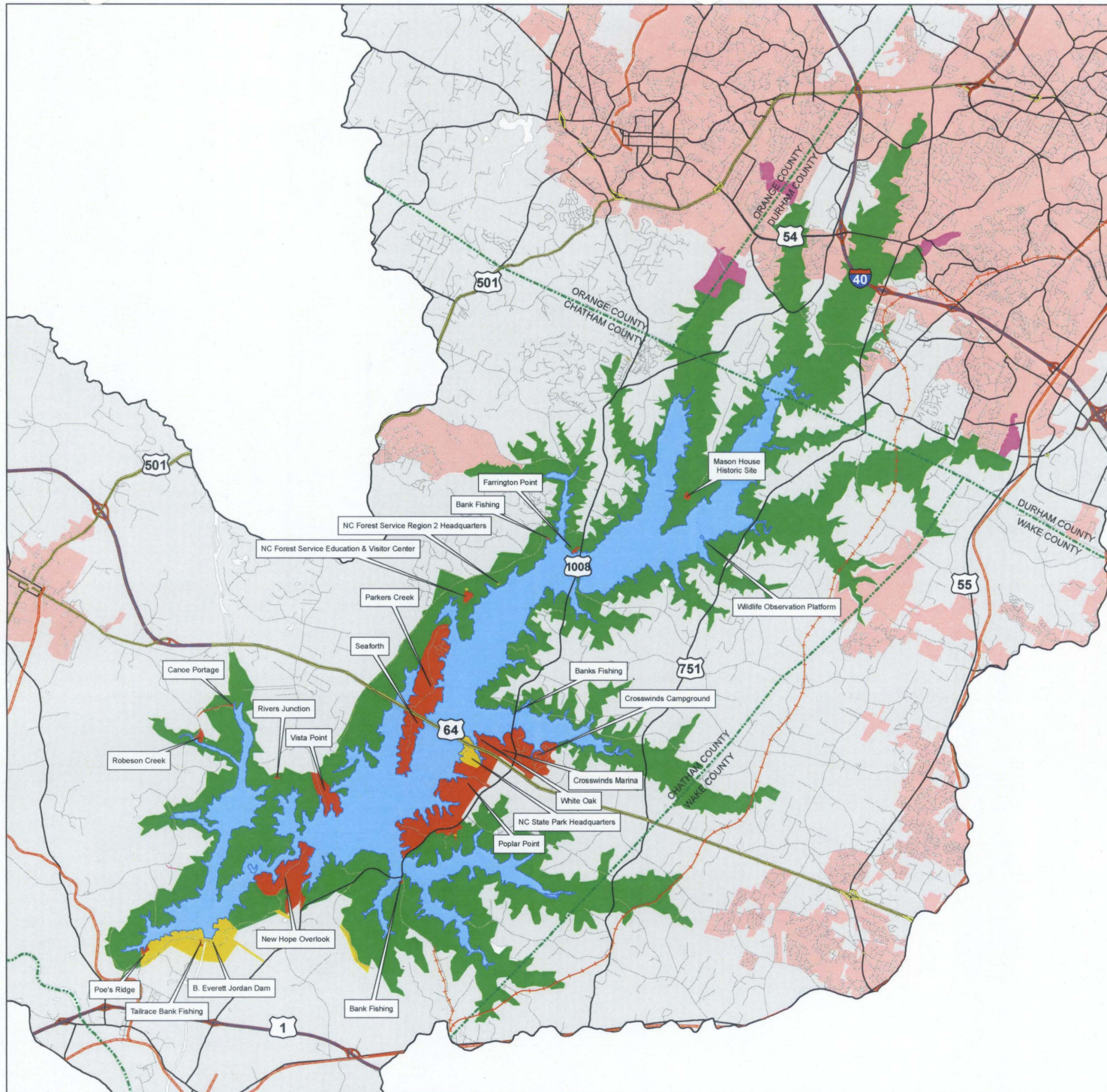
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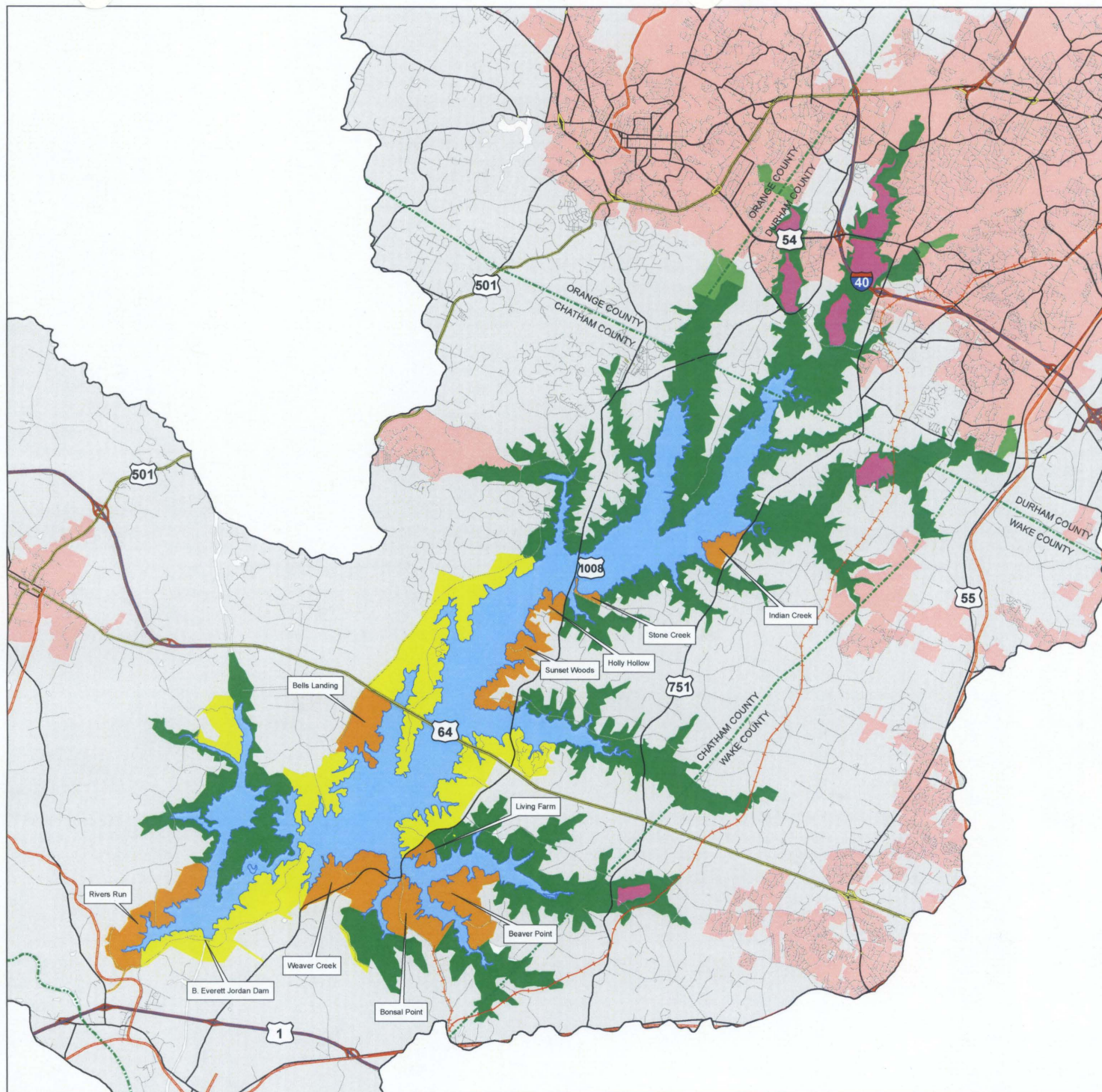
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LAND CLASSIFICATION

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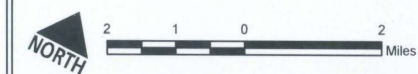




VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



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- State Hwys Major Thoroughfares
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- Active Recreational Line
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- City Limits
- Basin Boundary
- EASEMENT
- FUTURE RECREATION
- PERMANENT WILDLIFE
- EXISTING RECREATION
- SUBIMPOUNDMENTS

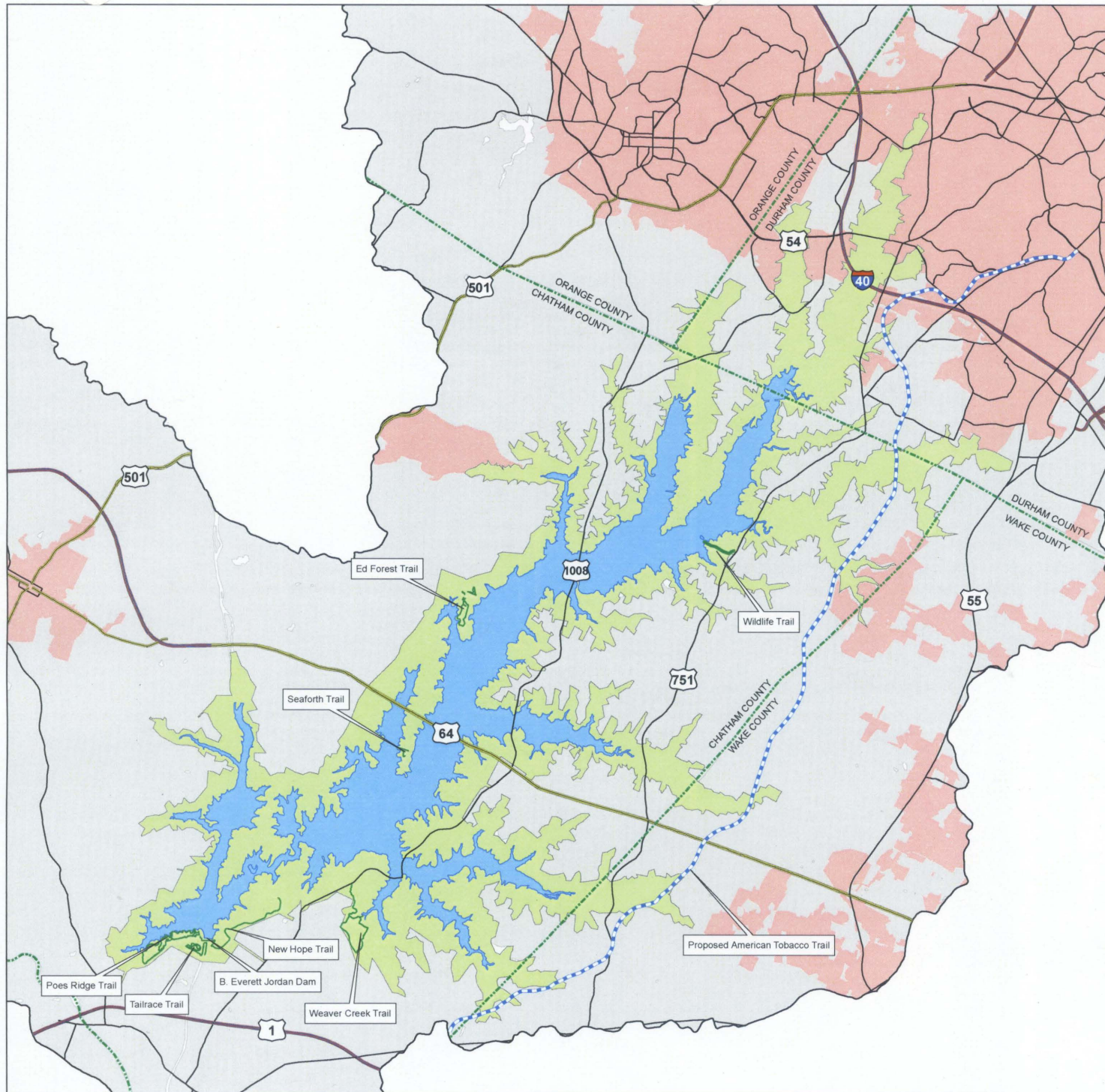


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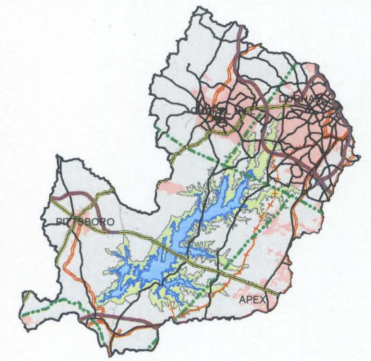
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POTENTIAL FUTURE RECREATION AREAS

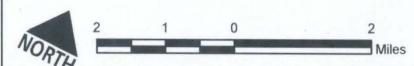
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VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



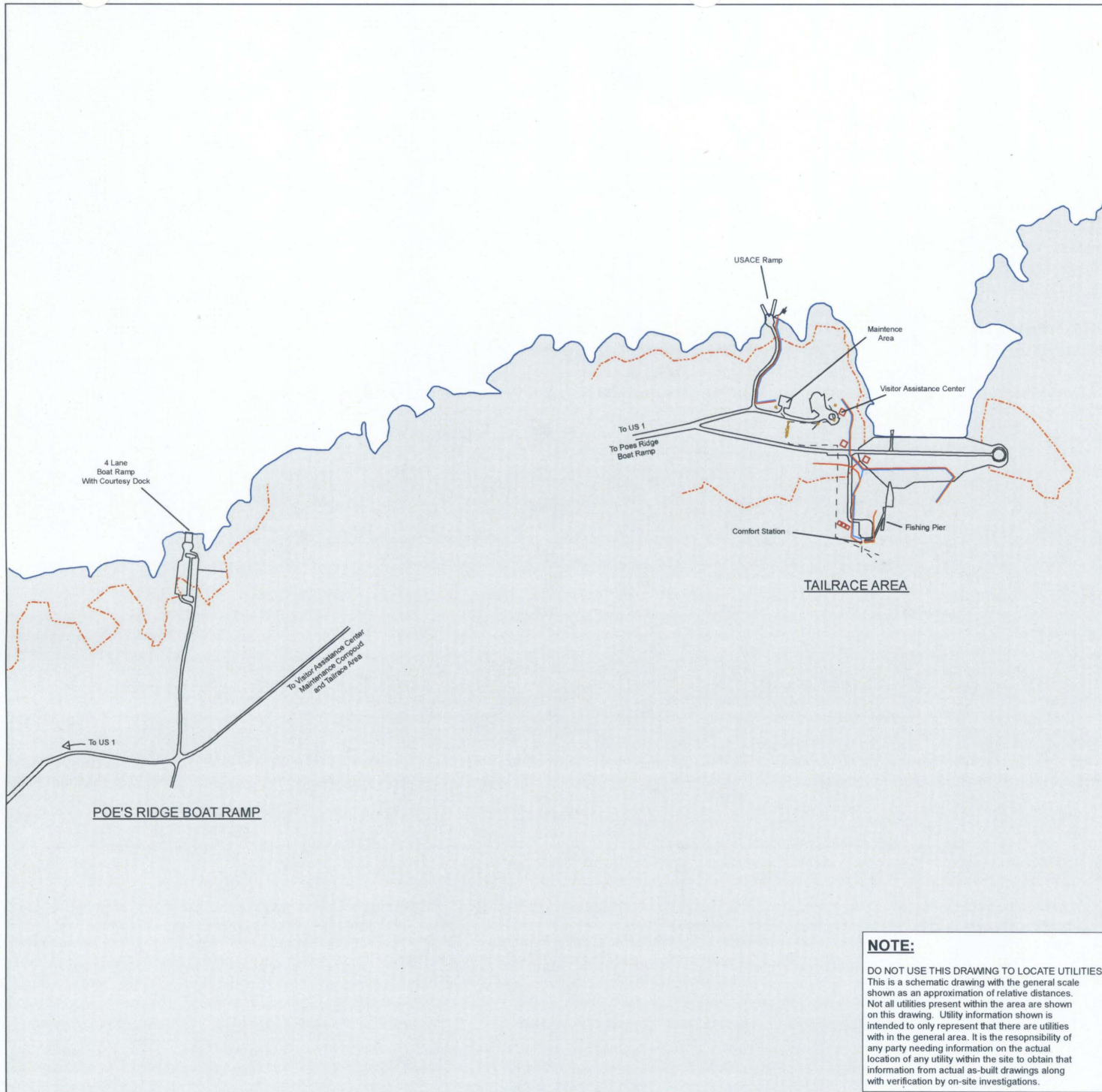
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- US Hwys, Major State Hwys
- State Hwys Major Thoroughfares
- County Line
- Abandoned Line
- Active Commercial Line
- Active Recreational Line
- Lake Pool Elev. 216ft msl
- Project Land
- City Limits
- Basin Boundary
- CONSTRUCTED HIKING TRAILS
- PROPOSED TRAILS



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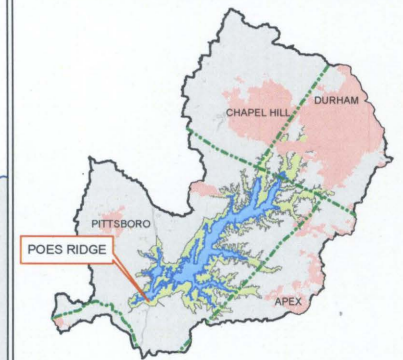
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TRAILS

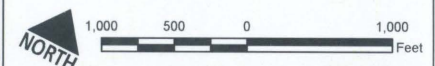


VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



- Picnic
- Manhole
- Powerline
- Roads
- Sewer Line
- Water line
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings



NOTE:

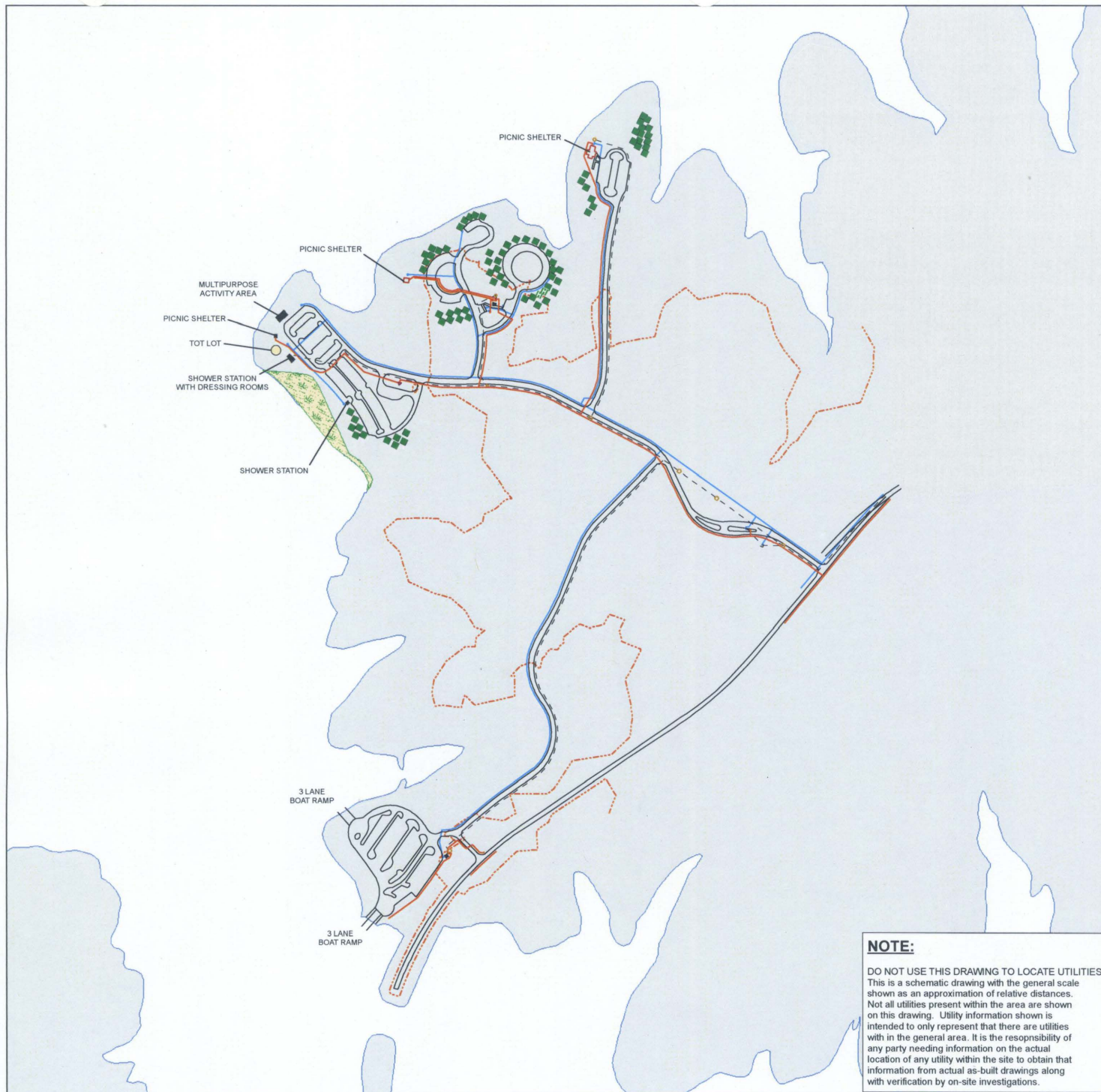
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This is a schematic drawing with the general scale shown as an approximation of relative distances. Not all utilities present within the area are shown on this drawing. Utility information shown is intended to only represent that there are utilities within the general area. It is the responsibility of any party needing information on the actual location of any utility within the site to obtain that information from actual as-built drawings along with verification by on-site investigations.

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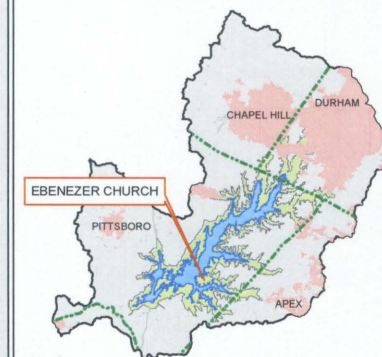
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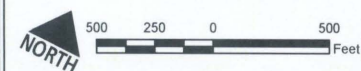


VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



- Picnic
- Handicaped Picnic
- Picnic Shelter
- Transformer
- Powerline
- Roads
- Manhole
- Sewer Line
- Water line
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Tot Lot
- Beach
- Buildings



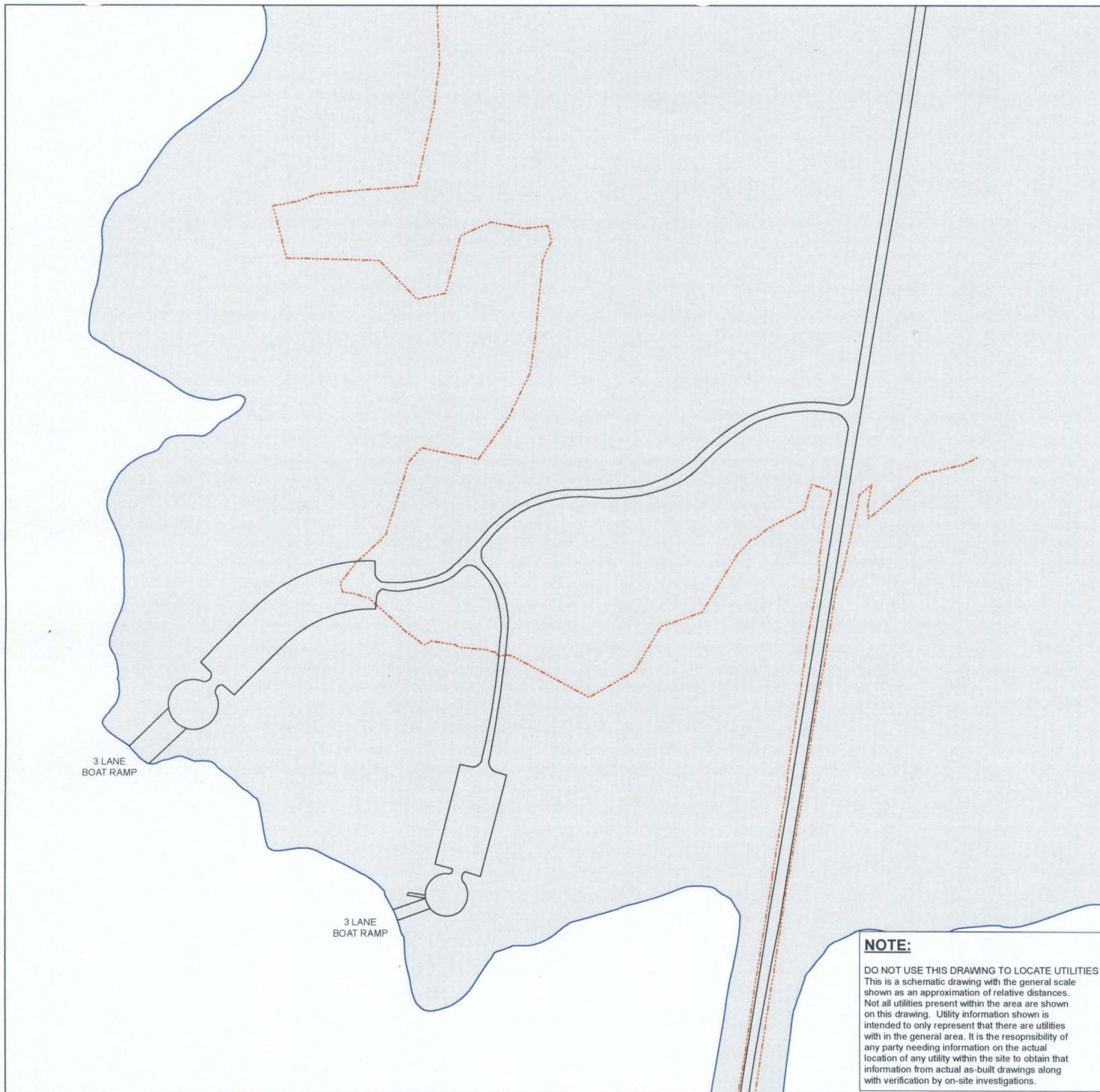
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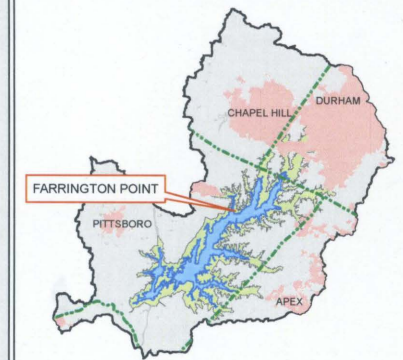
EBENEZER

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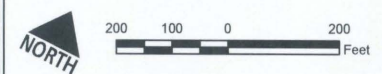
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VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Roads
- Lake Pool Elev. 216 msl
- - - 100yr Flood Plain

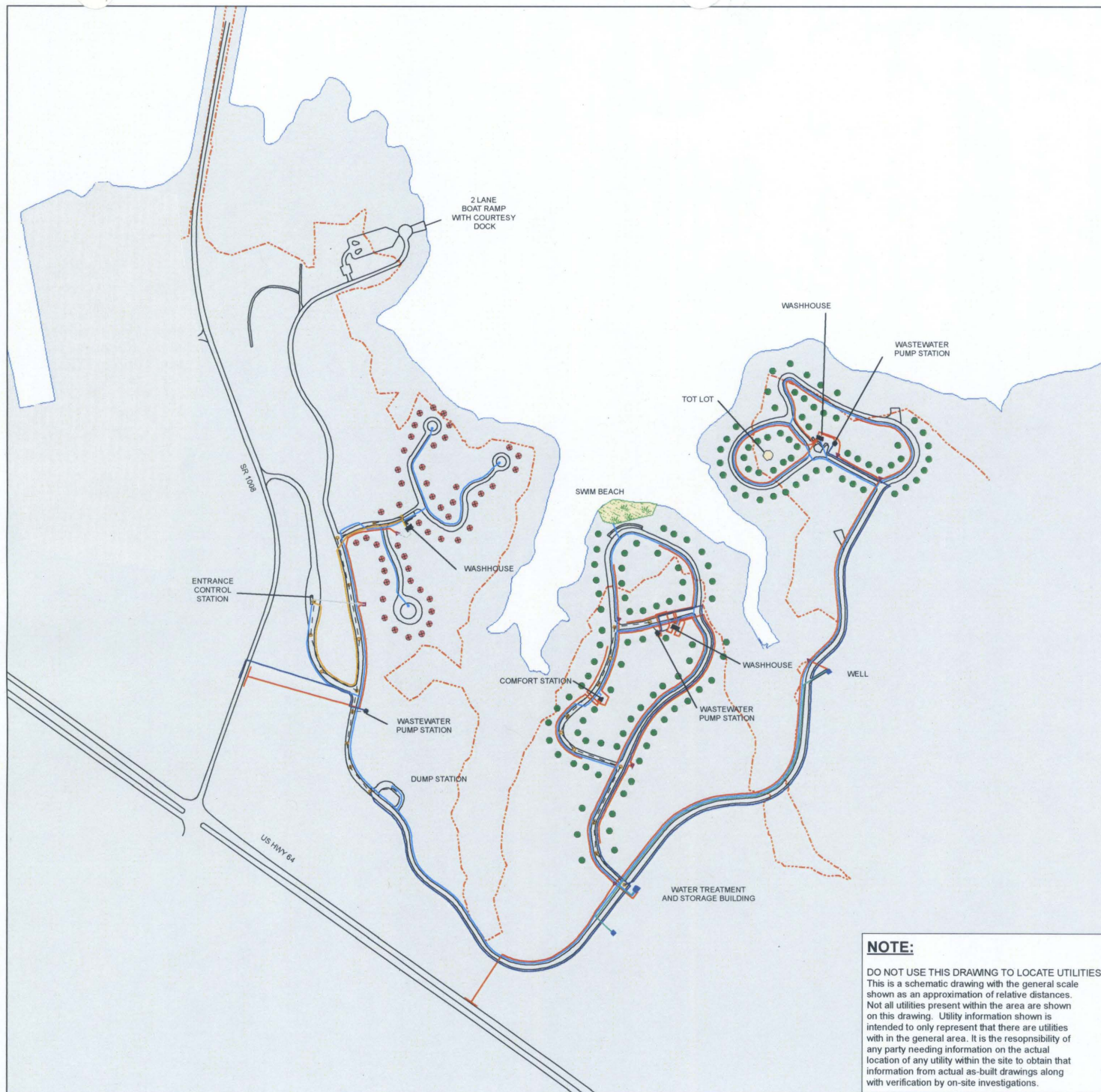


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CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

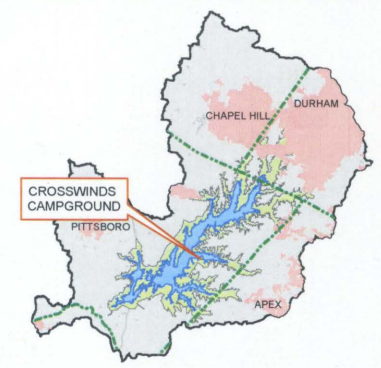
B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

FARRINGTON POINT

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VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Campsite w/out Power
- Campsite w/ Power
- Transformer
- Well
- Water line
- Raw Water Line
- Force Main
- Powerline
- Signal Cable
- S Line
- Manhole
- Sewer Line
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Tot Lot
- Beach
- Buildings

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U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

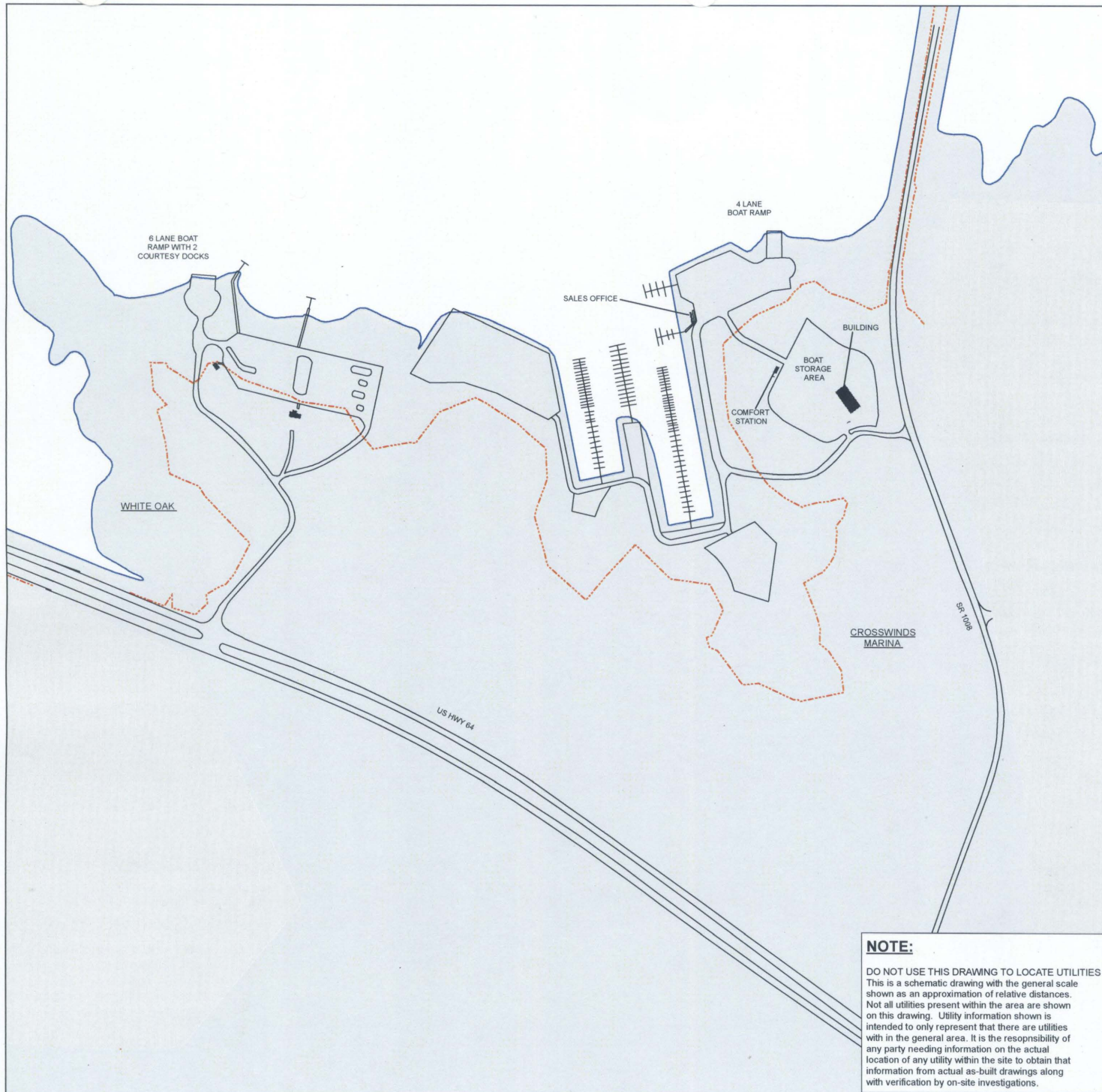
B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

CROSSWINDS CAMPGROUND

DRAWING NO. 19

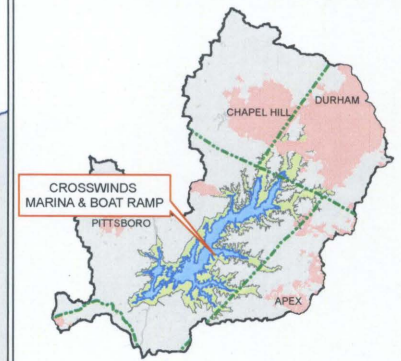
DATE 19 JUL 07

SHEET NO. 21

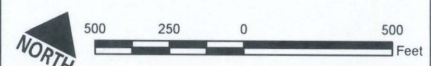


VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



- Roads
- - - 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Tot Lot
- Beach
- Buildings



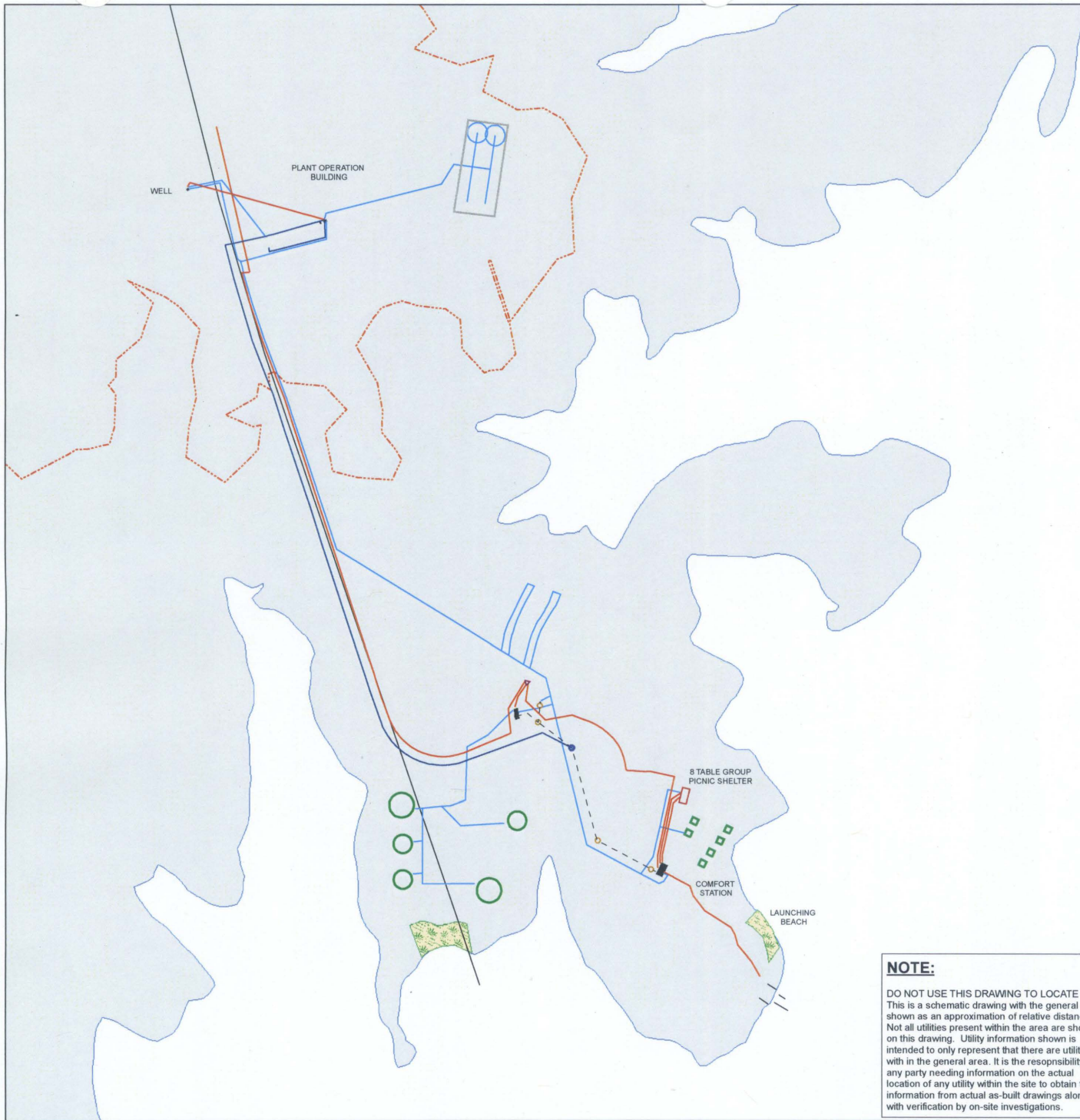
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U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

CROSSWINDS MARINA & WHITE OAK

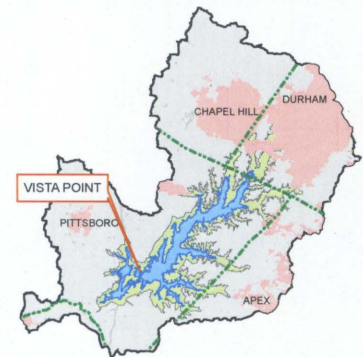
DRAWING NO. 20 DATE 19 JUL 07 SHEET NO. 22



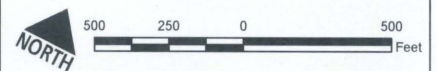
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VICINITY MAP **JORDAN HYDROLOGIC STUDY AREA**



- Water line
- Manhole
- Powerline
- - - Sewer Line
- Force Main
- Lift
- Fence
- Campsite
- Transformer
- Picnic Shelter
- Picnic
- Roads
- - - 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Beach
- Buildings

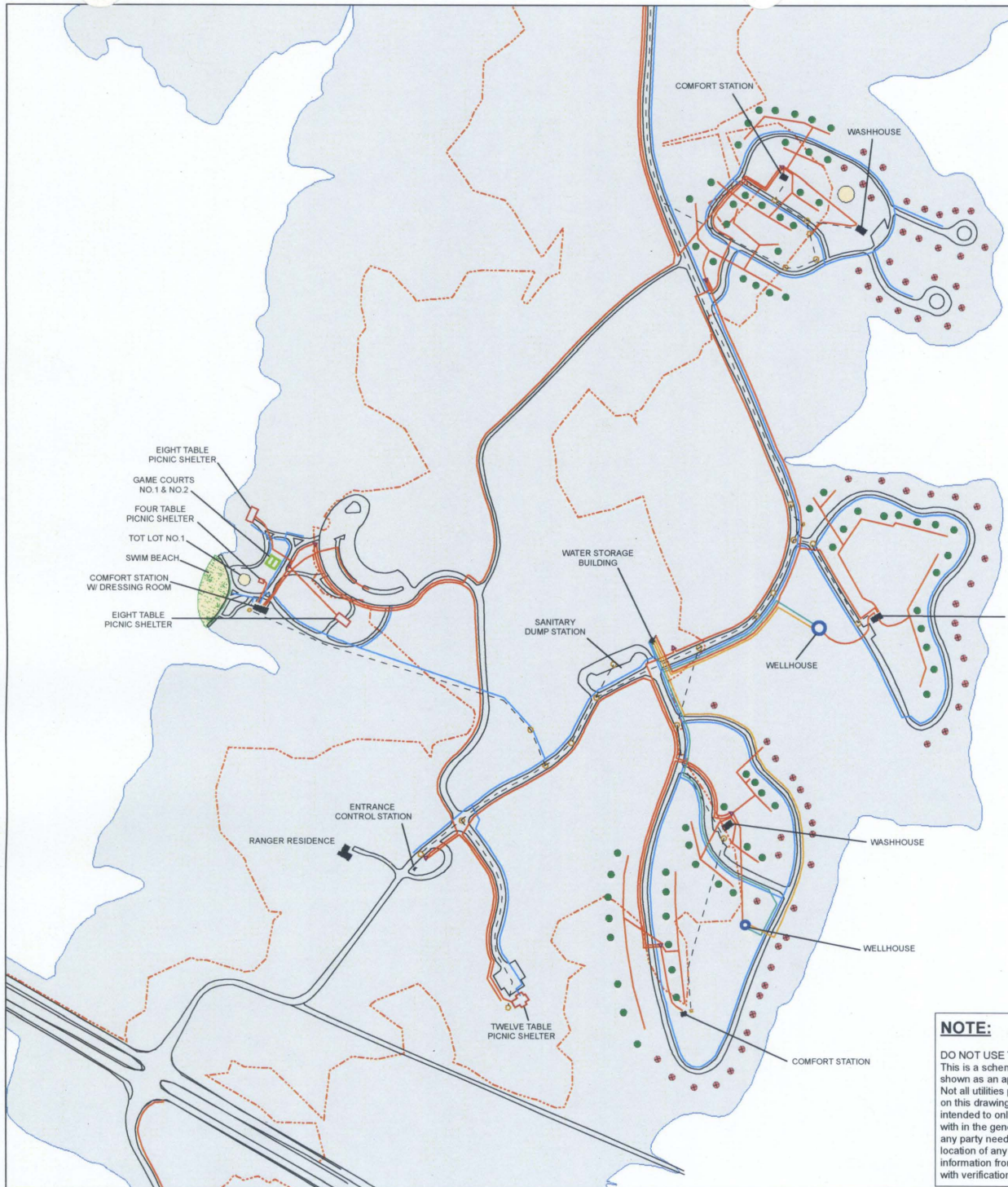


U.S. ARMY ENGINEER DISTRICT, WILMINGTON
 CORPS OF ENGINEERS
 WILMINGTON, NORTH CAROLINA

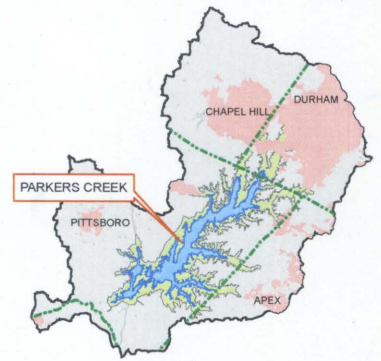
B. E. JORDAN DAM AND LAKE
 MASTER PLAN UPDATE

VISTA POINT

DRAWING NO. 21 DATE 19 JUL 07 SHEET NO. 23



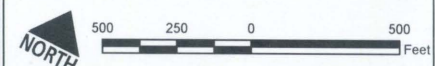
VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Campsite w/out Power
- Campsite w/ Power
- Transformer
- Water line
- Raw Water Line
- Powerline
- C Line
- Picnic Shelter
- Tennis
- Well
- Manhole
- Sewer Line
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Beach
- Tot Lot
- Buildings

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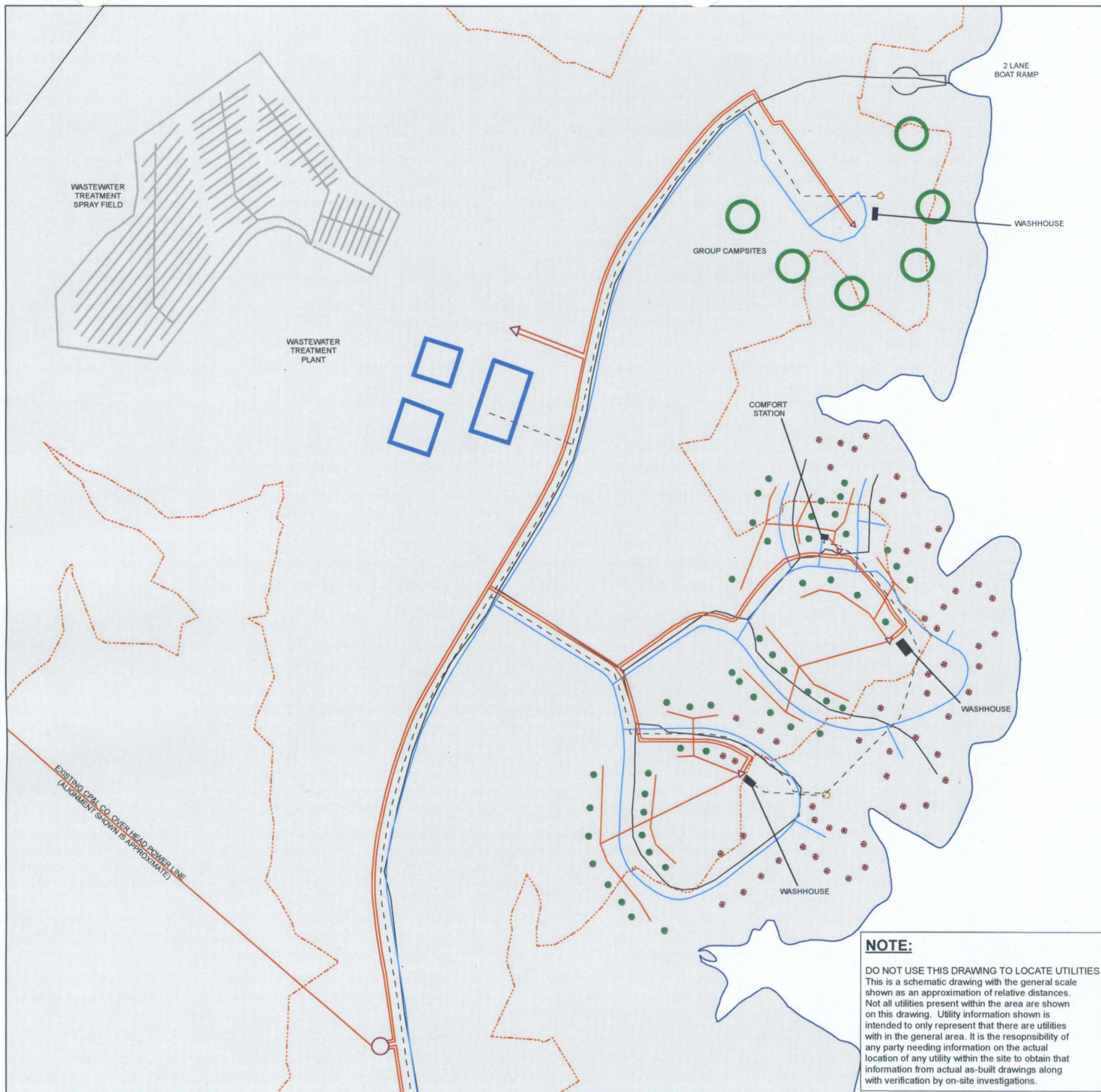


U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

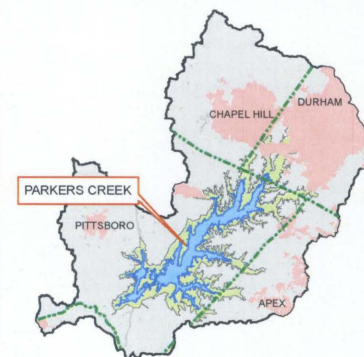
PARKERS CREEK

DRAWING NO. 22 DATE 19 JUL 07 SHEET NO. 24



VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



- Campsite w/out Power
- Campsite w/ Power
- Group Camp Sites
- Transformer
- Water line
- Powerline
- Manhole
- - - Sewer Line
- Spay Field
- Lagoon
- Roads
- - - 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings

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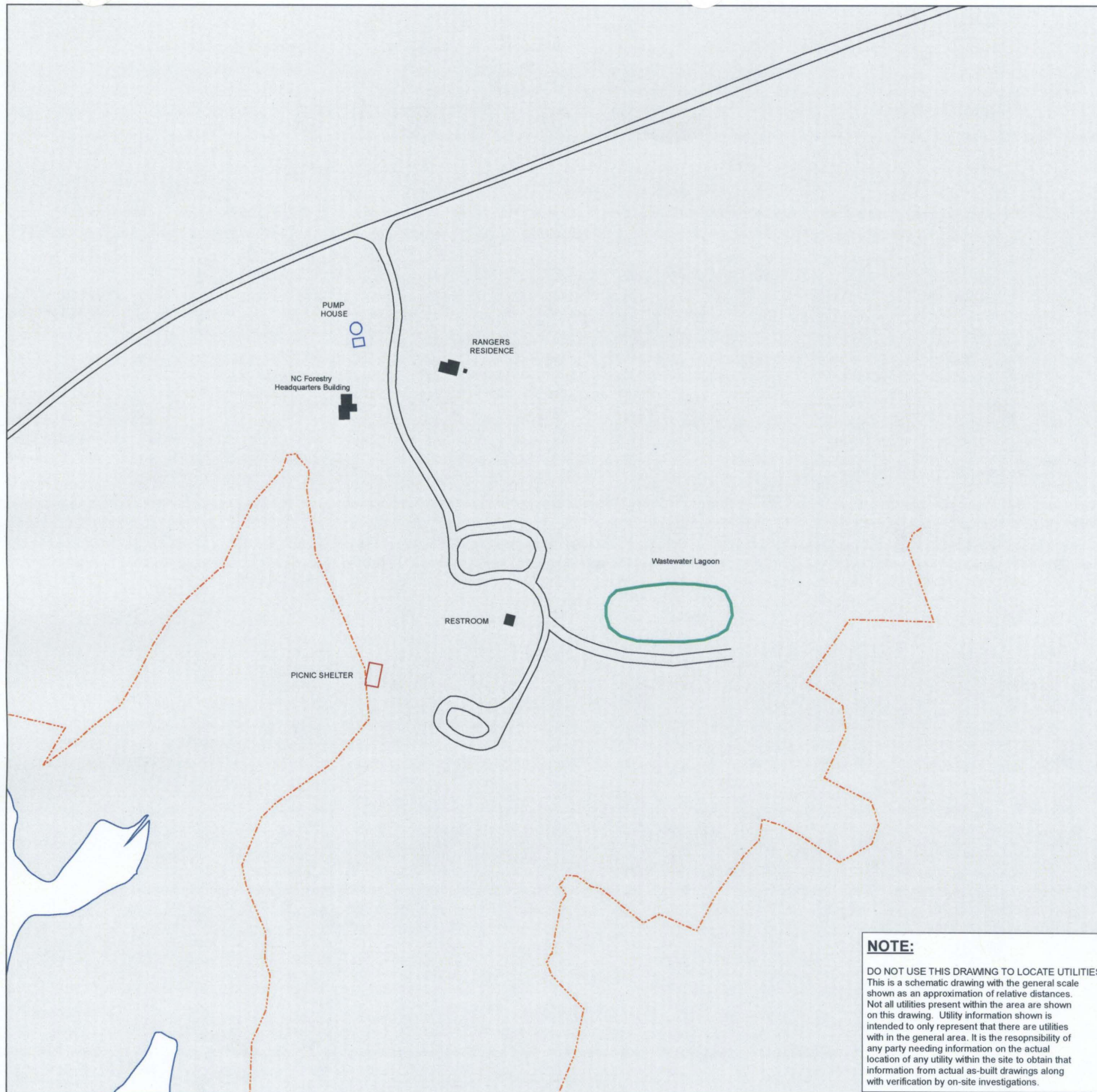
400 200 0 400 Feet

U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

PARKERS CREEK

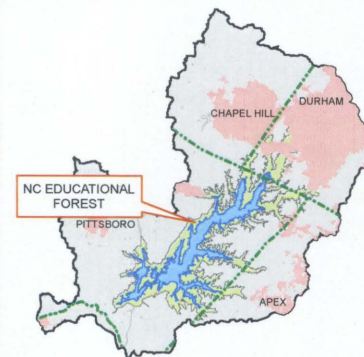
DRAWING NO. 23 DATE 19 JUL 07 SHEET NO. 25



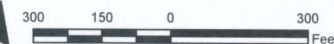
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VICINITY MAP
 JORDAN HYDROLOGIC STUDY AREA



- Septic
- Pump
- Shelter
- Water line
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings

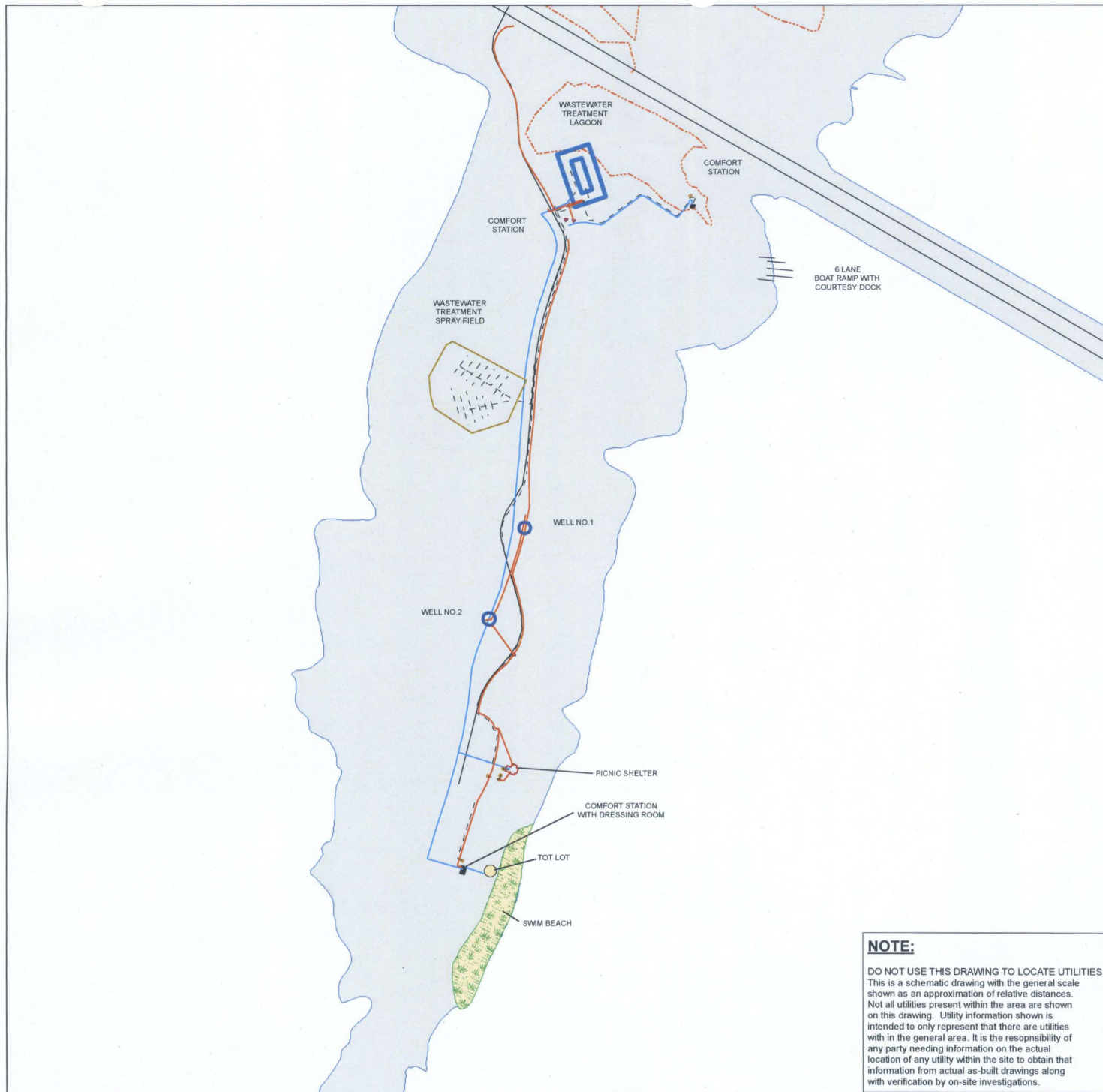


U.S. ARMY ENGINEER DISTRICT, WILMINGTON
 CORPS OF ENGINEERS
 WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
 MASTER PLAN UPDATE

**NORTH CAROLINA
 EDUCATIONAL FOREST**

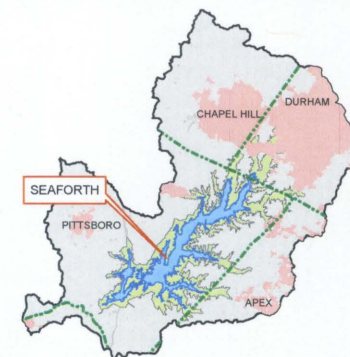
DRAWING NO. 24 DATE 19 JUL 07 SHEET NO. 26



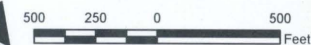
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VICINITY MAP
JORDAN HYDROLOGIC STUDY AREA



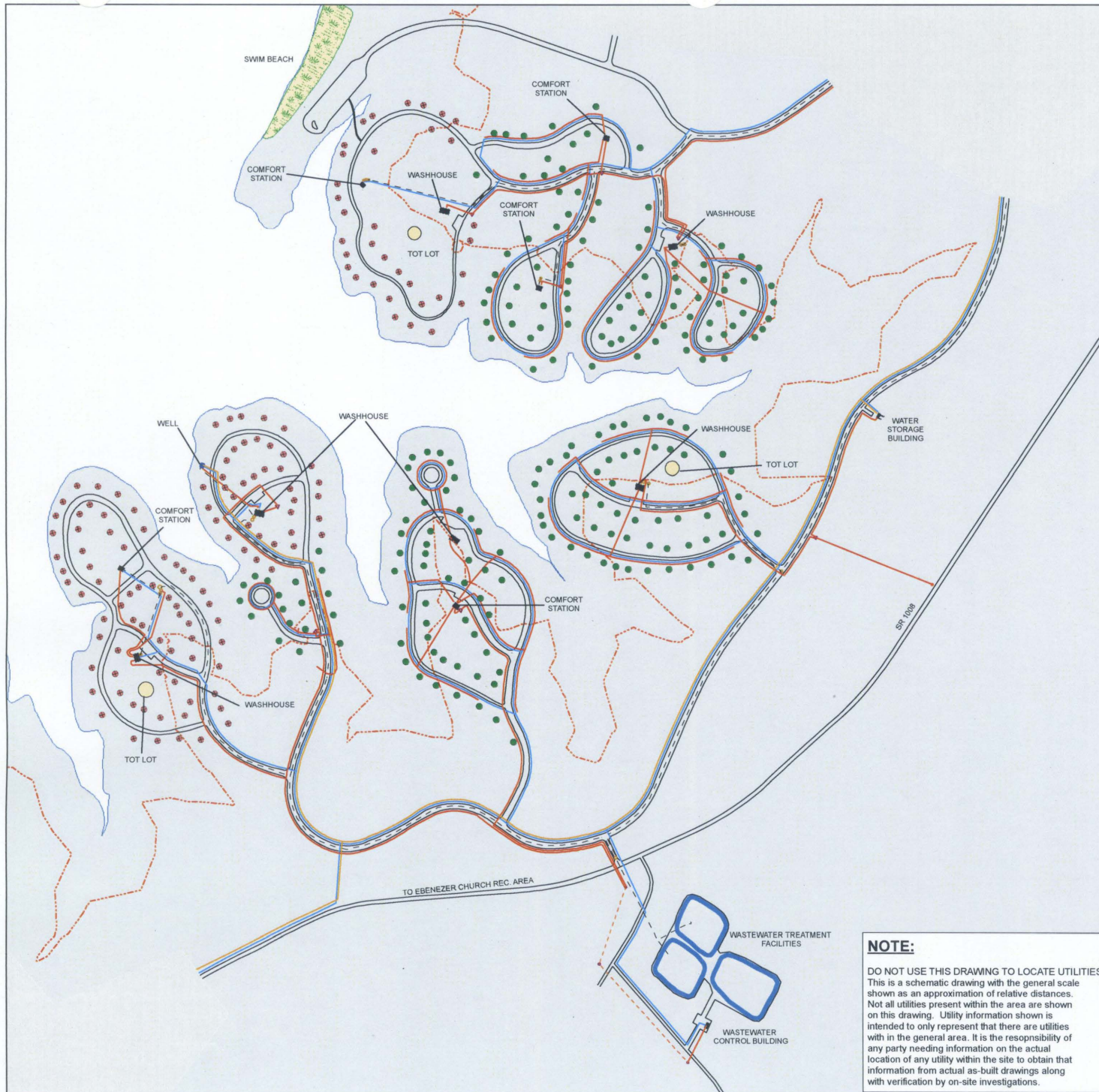
- Picnic Shelter
- Sprayfield
- Transformer
- Powerline
- Manhole
- Sewer Line
- Lagoon
- Well
- Water line
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Beach
- Tot Lot
- Buildings



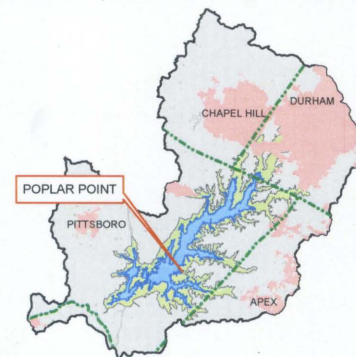
U.S. ARMY ENGINEER DISTRICT, WILMINGTON
 CORPS OF ENGINEERS
 WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
 MASTER PLAN UPDATE

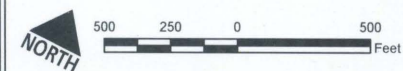
SEAFORTH



VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Campsite w/ Power
- Campsite w/out Power
- Transformer
- Powerline
- C Line
- AELine
- Manhole
- Sewer Line
- Lagoon
- Well
- Water line
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Beach
- Tot Lot
- Buildings



U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

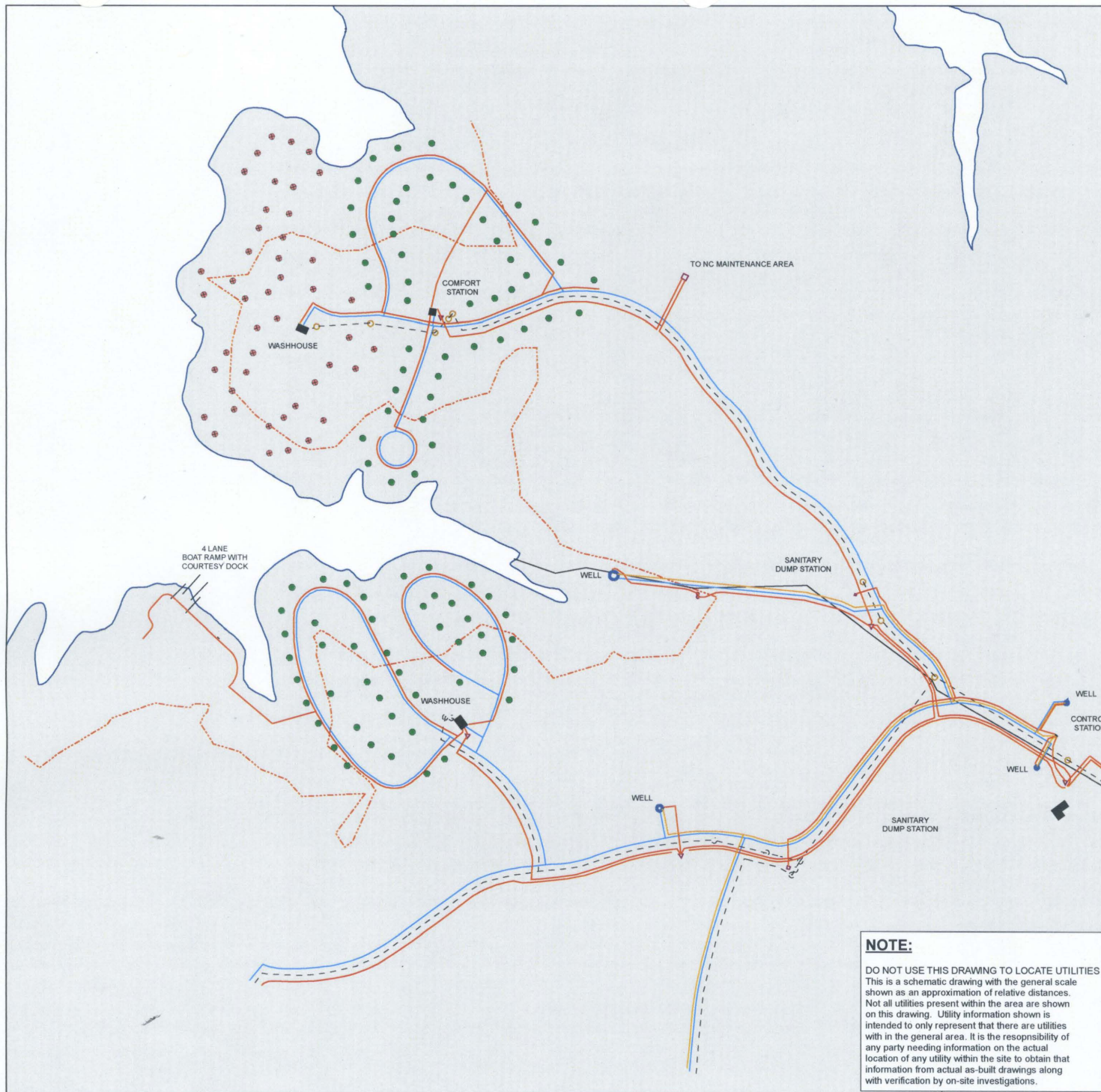
B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

POPLAR POINT

DRAWING NO. 26 DATE 19 JUL 07 SHEET NO. 28

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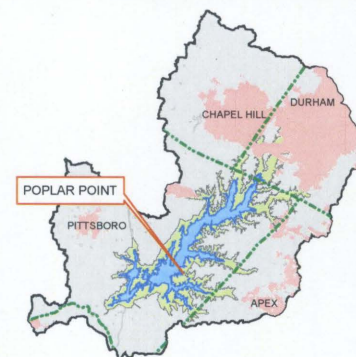


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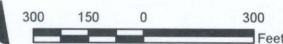
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VICINITY MAP

JORDAN HYDROLOGIC STUDY AREA



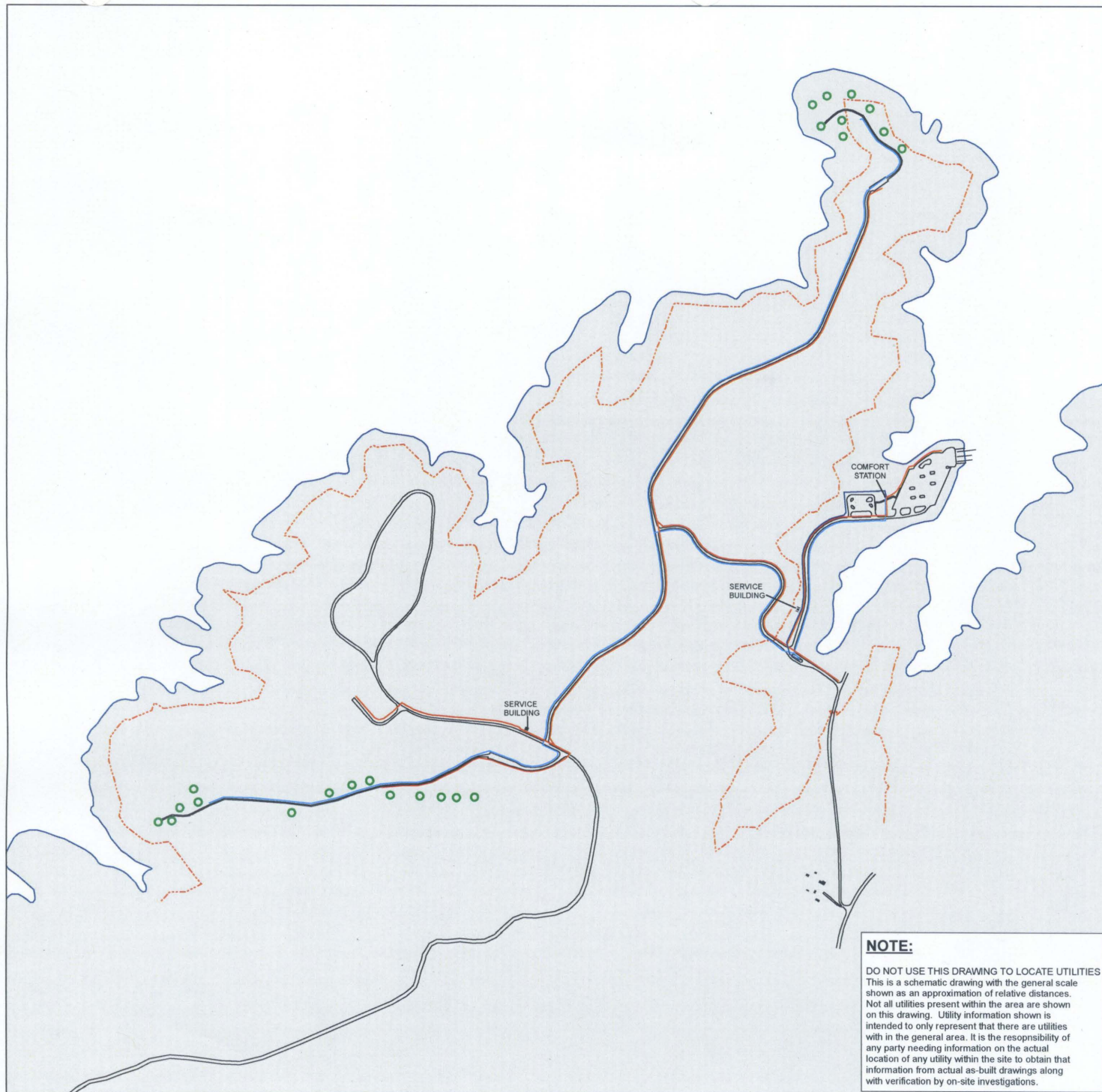
- Campsite w/ Power
- Campsite w/out Power
- Transformer
- Powerline
- C Line
- Manhole
- - - Sewer Line
- Well
- Water line
- Roads
- - - 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings



U.S. ARMY ENGINEER DISTRICT, WILMINGTON
 CORPS OF ENGINEERS
 WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
 MASTER PLAN UPDATE

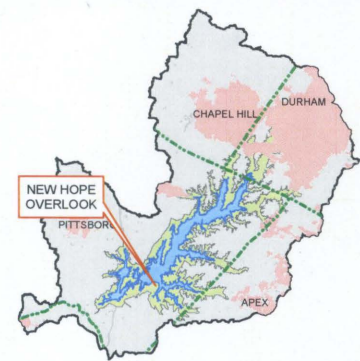
POPLAR POINT



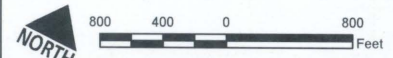
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VICINITY MAP
JORDAN HYDROLOGIC STUDY AREA



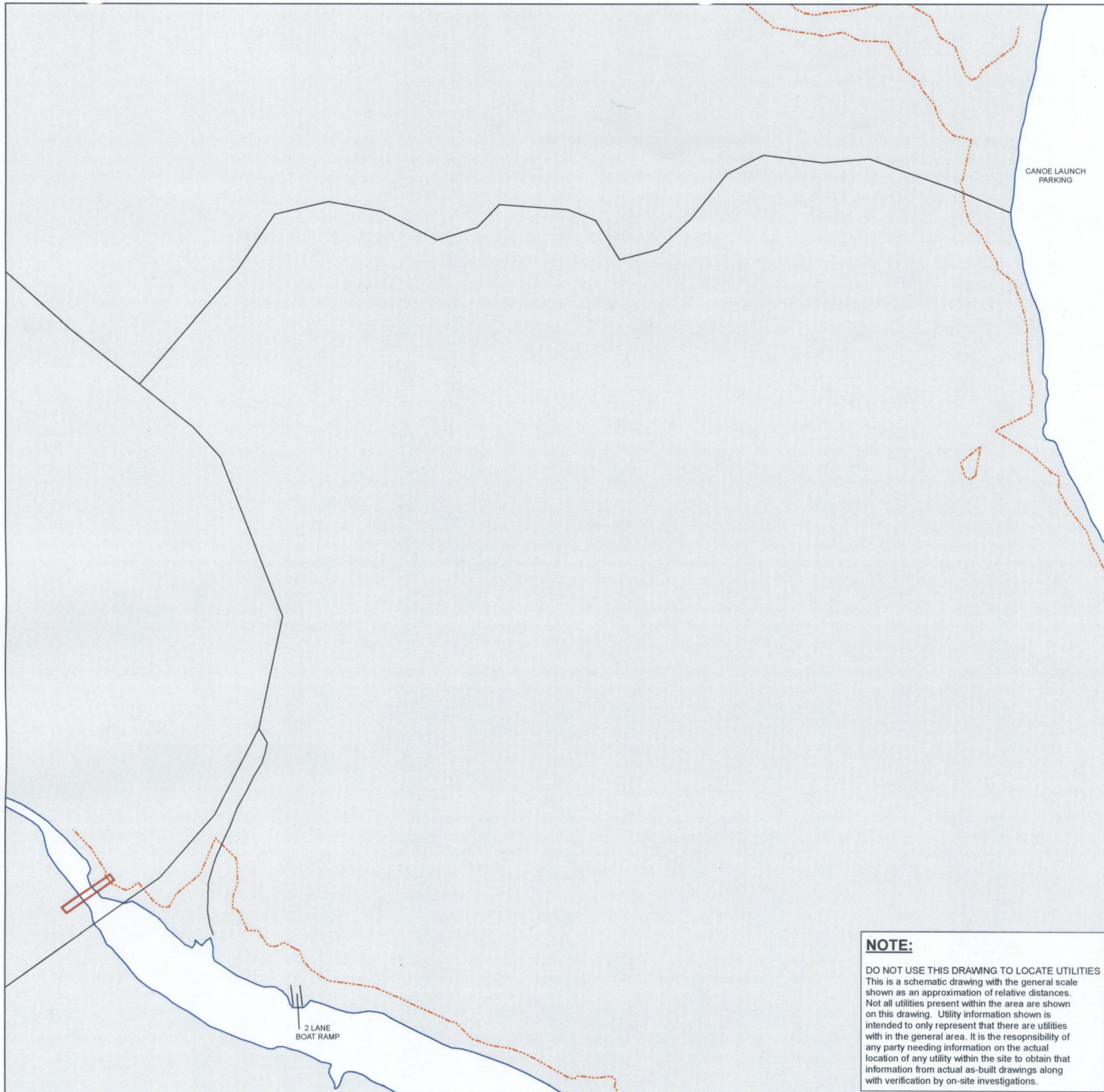
- Campsite
- Force Main
- Powerline
- Water line
- Roads
- - - 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings



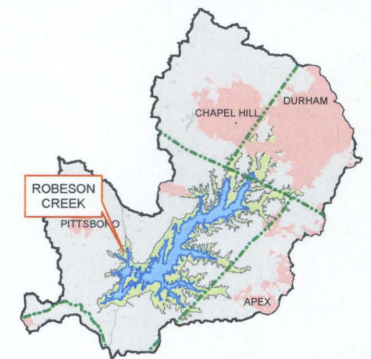
U.S. ARMY ENGINEER DISTRICT, WILMINGTON
 CORPS OF ENGINEERS
 WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
 MASTER PLAN UPDATE

**NEW HOPE
 OVERLOOK**



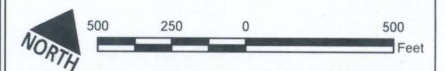
VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Bridge
- Roads
- 100yr Flood Plain
- Lake Pool Elev. 216 msl
- Buildings
- shoreline_shape

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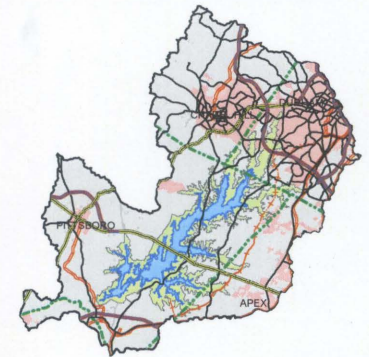
U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

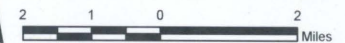
ROBESON CREEK

DRAWING NO. 29 DATE 19 JUL 07 SHEET NO. 31

VICINITY MAP JORDAN HYDROLOGIC STUDY AREA



- Interstates, Expressways, Parkways
- US Hwys, Major State Hwys
- State Hwys Major Thoroughfares
- Abandoned Line
- Active Commercial Line
- Active Recreational Line
- County Line
- Basin Boundary
- City Limits
- Lake Pool Elev. 216ft msl
- N.C. Division of Parks and Recreation
- N.C. Division of Forest Resources
- U.S. Army Corps of Engineers
- N.C. Wildlife Resources Commission-Interim
- N.C. Wildlife Resources Commission-Permanent
- N.C. Wildlife Resources Commission-Subimpoundments
- Private Lands



U.S. ARMY ENGINEER DISTRICT, WILMINGTON
CORPS OF ENGINEERS
WILMINGTON, NORTH CAROLINA

B. E. JORDAN DAM AND LAKE
MASTER PLAN UPDATE

OPERATIONAL MANAGEMENT PLAN

DRAWING NO. 30 DATE 19 JUL 07 SHEET NO. 32

