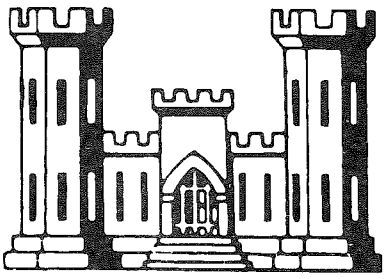
TRINIDAD LAKE PROJECT
PURGATOIRE RIVER, CO

DESIGN MEMORANDUM NO. 13

MASTER PLAN



DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
NEW MEXICO

October 1975

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1580
ALBUQUERQUE, NEW MEXICO 87103

SWAED-EP

21 October 1975

SUBJECT: Transmittal of Trinidad Lake Project, Purgatoire River, Colorado, Master Plan (Design Memorandum No. 13)

THRU: Division Engineer, Southwestern, ATTN: SWDPL-R

TO: HQDA (DAEN-CWP-V)
WASH DC 20314

1. Submitted herewith are nine copies of the Trinidad Lake Project Master Plan for review and approval. Four copies of the memorandum are included for retention by the Southwestern Division. The Master Plan has been accomplished in accordance with ER 1120-2-400, "Investigations, Planning, and Development of Water Resources."

2. In the event that additional information is desired or any questions arise concerning the data in this design memorandum, please contact Mr. David L. Clawson, Telephone Number (505) 766-2657.

FOR THE DISTRICT ENGINEER:

1 Incl (9 copies)
as

for JASPER H. COOMBES, P.E.
Chief, Engineering Division

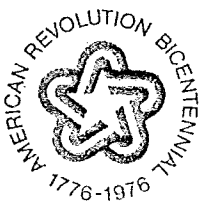


TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

AREA AND FACILITY DESIGN
Plates 4-18

TABLES

TABLE OF CONTENTS

PREFACE

This Master Plan addresses itself to the orderly and balanced development of the project potential whereby the projected public need can best be served. Definition of land use and of structural needs for accommodation of public use projected are prime objectives of the plan.

Recreational area and facility development will be by the United States Army, Corps of Engineers. Management and operation of the public use function will be the responsibility of the Colorado Division of Parks and Outdoor Recreation and project visitors will be governed by policies instituted by this state agency.

SUMMARY

This Master Plan provides a basis for the development of the Trinidad Lake Project and facilities needed to satisfy the anticipated recreational demand. The project is currently in the construction phase and when completed will be a multi-purpose development functioning for flood control, irrigation storage and regulation, sediment retention, and, with the acquisition of water for the maintenance of a permanent pool by the State of Colorado, enhanced recreation and fishery resources.

The Corps of Engineers will develop and construct the initial recreation areas and facilities. Management authority will be assigned to the Colorado Division of Parks and Outdoor Recreation by Standard Recreation Lease Agreement. The Colorado Division of Wildlife will manage an area specifically reserved for wildlife. Project visitation will consist of residents of the project area as well as interstate travelers. Calculated annual visitation to the project will be about 150,000 with increases in later years calculated to year 2020. Recreational development at the project will consist of three areas where facilities for boating, picnicking, camping, and sightseeing will be provided. Water-oriented activities such as fishing, swimming, water-skiing and motorboating will be available on the lake.

Planned recreation sites are located primarily on the north side of the lake with a group camping area on the south side below the dam. Planned facilities include a visitor information center with interpretative displays, 2 overlooks, comfort station/washhouse combination, vault toilets, water system, boat launching ramp, courtesy dock, picnic areas, camp area, play equipment, and interpretative signs at the overlook.

Cost of the facilities will be approximately $1,720,000.

TRINIDAD LAKE PROJECT
PURGATOIRE RIVER
LAS ANIMAS COUNTY, COLORADO

PROJECT DATA SHEET

Location

Two and Three-Quarter Miles Upstream from city of Trinidad, Colorado

Function

Flood Control, Irrigation, and Recreation

Authority

Flood Control Act of 1958, Public Law 85-500, 85th Congress

Drainage Area

Total	671 square miles
Contributing to Standard Project Flood	606 square miles

Project Acreage

Fee Lands	3,542.04
Easement Lands	190.93
Total Lands	3,732.97

Facility Area Requirements (approx.)

Embankment (including outlet works and connection channel	92 acres
Spillway (including discharge channel)	21 acres
Relocated State Highway 12	249 acres
Relocated C&W Railroad	245 acres
Recreation lands (above irrigation pool elevation)	680 acres
Operations Area	2 acres

Reservoir

*Allocated Storage Capacities:

Flood Control	57,200 acre-feet
Irrigation	20,000 acre-feet
Permanent Pool	4,500 acre-feet
Joint Use for Irrigation and Sediment Accumulation	39,000 acre-feet
Total Allocated Capacity	120,700 acre-feet

Initial Conditions:

	Elevation (Above MSL)	Storage (Acre-Feet)	Surface Area (Acres)
Maximum pool	6276.0	158,500	2,524
Flood Control	6259.6	120,700	2,097
Irrigation	6228.4	63,500	1,421
Sediment	-	39,000	-
Permanent Pool	6142.8	4,500	213

(The permanent pool will vary from elevation 6142.8 for initial conditions to elevation 6192 over the 75-year economic life of the project).

Pool Length and Shoreline:

	Length (Miles)	Shoreline (Miles)
Elevation 6259.6	4.8	29.8
Elevation 6226.4	3.9	18.2
Elevation 6142.8	1.5	5.4

Dam

Earthfill, Rock Slope Protection

Crest Elevation	6,281 feet (MSL)
Height above Streambed	200 feet
Crest Length	6,860 feet

Spillway: Uncontrolled; rock cut in left abutment with 15 feet x 40 feet ogee notch.

Crest Elevation	6,258.0 feet (MSL)
Notch Elevation	6,243.0 feet
Crest Width	1,000.0 feet
Maximum Discharge	240,000 c.f.s.

* Based on 1966 topography

Outlet Works: 10-foot diameter, gate-controlled single conduit, with 2 service and 2 emergency hydraulic slide gates, each 5 feet by 9 feet.

Intake Invert Elevation.	6,095.0 feet (MSL)
Outlet Invert Elevation.	6,080.0 feet
Flip Bucket, Floor	6,070.0 feet
Flip Bucket, End Sill.	6,077.5 feet
Maximum Discharge.	5,475 c.f.s.

Relocations:

Colorado and Wyoming Railroad.	8.8 miles
Highway and Roads.	13.0 miles
Powerlines and Telephone & Telegraph Facilities	10.9 miles
Water Supply: Reservoir.	4,500,000 gallons
Waterlines	9.4 miles
Cemeteries, Carpios, Longsdale and Lave Plot	631 graves

Towns and Population:

Piedmont	70
Sopris (including Jerryville and St. Thomas).	1,200
Sopris Plaza	133
Viola.	102

TRINIDAD LAKE PROJECT
PURGATOIRE RIVER, COLORADO
DESIGN MEMORANDUM NO. 13

MASTER PLAN FOR DEVELOPMENT AND MANAGEMENT OF TRINIDAD LAKE

SECTION I - INTRODUCTION

1-01. Project Authorization and Related Legislation. Congressional authorization for construction of Trinidad Dam and Reservoir is contained in Section 203, Title II, of the Flood Control Act of 1958, Public Law 85-500, 85th Congress, as follows: "The project for the Trinidad Dam on Purgatoire River, Colorado, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 325, Eighty-fourth Congress, at an estimated cost of $16,628,000." House Document No. 325 recommended a modification of an earlier authorized floodway plan that would have provided local flood protection for Trinidad (authorized 22 December, 1944 by Public Law 534, 78th Congress, 2nd Session) by means of levees and channel works. In lieu of this plan, a multipurpose reservoir, primarily for flood control and irrigation, was recommended.

Section 201, Title II, of the Flood Control Act of 1965, Public Law 89-298, approved 27 October 1965, amended Public Law 85-500 to relieve the city of Trinidad from making a cash contribution of 4.5 percent of the first cost allocated to flood control. This contribution has reverted to federal (Corps of Engineers) cost. However, in lieu of this local cooperation, the city is responsible for maintaining a 15,000-cubic-feet-per-second channel through town.

The basic legislation relating to the development of reservoir areas under the control of the Department of the Army for recreational purposes is contained in Section 4 of the Flood Control Act approved 22 December 1944 (Public Law 534, 78th Congress, 2d Session) as amended by Section 207 of the Flood Control Act of 1962, as further amended by Section 2 of the Land and Water Conservation Fund Act of 1965. The amended Section 207 provides authority for the Chief of Engineers, under the supervision of the Secretary of the Army, to construct, maintain, and operate public park and recreation facilities at water resource projects under the control of the Department of the Army. Additionally, authority is provided for certain outleasing practices and conditions for public use and access.

The requirements of local cooperation as specified in the

basic authorizing act and not abrogated by Public Law 89-298 are as follows:

> "...that repayment of the first cost allocated to irrigation, established as 51 percent of the total project cost and presently estimated at $8,732,000, and the local contribution toward annual maintenance and operation, established as 54 percent of the total cost of the project annual maintenance and operation and presently estimated at $12,000, be generally in accordance with federal reclamation law procedures except that repayment of the irrigation first cost may extend over a period not to exceed 75 years...."

1-02. Project Purposes. Reservoir storage was authorized for flood control and irrigation purposes as recommended by the Chief of Engineers. The authorized project did not provide permanent storage for fish and wildlife and recreation. It did contain, however, the reservation that this would not preclude its future consideration if water were made available for such use. During design memorandum studies, the State of Colorado requested an allocation of 4,500 acre-feet of storage for public use purposes and indicated that the state would acquire the necessary water rights. Consequently, storage capacity for public use is included in the project.

Development of the recreational potential and fish and wildlife enhancement at federal water resources projects were established as full project purposes in the Federal Water Project Recreation Act of 1965, Public Law 89-72 (See ER 1120-2-404, paragraphs 6 and 7).

1-03. Project Benefits. Average annual benefits of the completed project are broken down as follows:

Flood Control	$1,084,000	54.31%
Irrigation	270,000	13.53%
Recreation	226,000	11.32%
Area Redevelopment	416,000	20.84%
Total	$1,996,000	100.00%

1-04. Application of Certain Public Laws.

A. Public Law 534-78th Congress, the Flood Control Act of 1944, Section 4, as amended by the Flood Control Act of 1962, grants general permissive authority to construct recreational developments at all water resource developments under the control of the Secretary of the Army.

B. Public Law 89-72, the Federal Water Project Recreation Act of 1965, modifies Section 4 authority by imposing non-Federal cost sharing requirements for recreation and wildlife enhancement at projects authorized after 1 January 1965. The Trinidad Lake Project is affected as a pre-1965 authorization in that cost sharing for recreation and fish and wildlife improvements will be required when the project becomes operational. This act also defines development of the recreation and wildlife potentials at federal water resource projects as full project purposes under conditions of the Act. Initial recreational development of Trinidad Lake will be federally financed by the Corps of Engineers.

C. Public Law 89-80, the Federal Water Resources Planning Act, does not affect the Trinidad Lake Project directly.

D. Public Law 85-624, the Fish and Wildlife Coordination Act, requires coordination with the U.S. Fish and Wildlife Service and State wildlife administrators concerning wildlife resources and values at water resource projects under federal jurisdiction or federal permit or license, and provides authority for licensing federal water project lands to states.

E. In compliance with Public Law 91-190, the National Environmental Policy Act of 1969, a comprehensive environmental statement has been prepared, coordinated among agencies and individuals, and is on file with the President's Council on Environmental Quality. The plan of development, operation, and management presented in this Master Plan is attendant to issues surfaced during preparation of the environmental statement and strives to develop and maintain a project that not only functions to preserve life and property but to enhance public enjoyment and preserve or improve environmental harmony and balance.

F. Public Law 92-500, "Federal Water Pollution Control Act Amendment of 1972," has as its objective, the restoration and maintainance of the chemical, physical, and biological integrity of the nation's waters. Consonant with this law, sanitary collection and treatment facilities are so designed that in no way will there be contamination of surface or subsurface waters.

1-05. Purpose and Scope of Master Plan. The intent of this Master Plan is to provide guidance for the orderly and progressive development, management, and utilization of the Trinidad Lake Project. The plan is flexible and will be updated at 5-year intervals as required by Engineering Regulation 1120-2-400, paragraph 13. The plan is concerned with the estimation of public use and definition of structural needs for accommodation of public use. To accomplish this end the plan will examine and evaluate the recreational and environmental resources of the project area,

factors influencing and constraining resource development and management, physical plan of development, facility load and other design criteria, special problems, cost estimates, conclusions, and recommendation. The plan of development will seek to provide a wholesome and high-quality outdoor recreation experience while assuring that the impact on project resources will be minimized. Private exploitation, incompatible uses, and despoilment of project resources will not be permitted.

The Master Plan is to serve as both a short range (or feature) design memorandum for construction of initial recreation facilities and as a long-range planning document which establishes the basis for preservation, development, and management of project resources.

1-06. Project Status. Construction of the Trinidad Lake Project was initiated on 2 May 1968 and is currently in that stage of development. The current estimated completion date is December 17, 1976. Delays of construction schedules have occurred as a result of inclement weather conditions, and other delays may occur in the future.

1-07. Non-Federal Managing Agencies. The Colorado Department of Natural Resources has expressed interest in acquiring a permanent pool at Trinidad Lake several times during planning stages. The intention to acquire permanent pool water and to assume recreation management responsibility was reaffirmed by letter April 27, 1973 (Exhibit 5). The Division of Parks and Outdoor Recreation and the Division of Wildlife are within the Department of Natural Resources.

A. Authority for management, operation and maintenance of the public use areas will be granted to the Colorado Division of Parks and Outdoor Recreation, through the Department of Natural Resources, by Standard Recreation Lease Agreement, suitably amended to consider conditions which may become apparent. It is the present intention of the Department to request inclusion of the entire project, excluding the structural zone, in the lease agreement. The Division will administer, operate, and maintain the public use areas in accordance with this master plan and with an annual management program to be mutually agreed upon between the Division and the Corps.

B. Management of wildlife resources will be by the Colorado Division of Wildlife. Authority for fish and wildlife management will be granted in the form of a license, through the Colorado Department of Natural Resources, with specific conditions included relating to management of the wildlife resource. The Division of Wildlife will establish and manage the fishery, manage waterfowl and develop habitat, manage upland and big game, promote non-game species, and regulate hunting on project lands.

C. In the unlikely event that water for a permanent pool cannot be obtained, it is doubtful that the State or any local body will have an interest in assuming recreation management responsibility. Alternatives will be explored if and when warranted by circumstances. Recreation management by the Corps in lieu of State or local management will be based primarily on scaled down or minimal structural facilities for recreation and the maintenance of public open space for general use. Since stored water for irrigation purposes will provide, at times, the opportunity for water-oriented recreation, limited facilities such as picnic tables and shelters, a boat launching ramp, and solid waste receptacles could be provided.

D. Present plans of the Colorado Division of Parks and Outdoor Recreation are to collect, through the honor system, any fees required. Collection procedures will be modified as necessary and the Division will provide any special fee collecting facilities needed. In the event of relinquishment or revocation of the agreement with the managing agency, the Corps is expected to handle fee collection under a similar system as provided for by current regulation. If the permanent pool is not established, a reduced number of facilities will be installed, and any fee collection required will be handled administratively under current regulations. Fee collection station locations are designated, but special collection facilities are to be provided administratively.

E. Recreational operation, maintenance and replacement cost recovery will be by the managing agency through current procedures standard with that agency, subject to conditions of the lease agreement and the review and approval of the District Engineer. If recreation management responsibility reverts to, or is retained by the Corps, the recovery of annual recreational operation, maintenance, and replacement costs will be managed administratively as directed by current regulations.

1-08. Previously Issued Design Memorandums. All previously issued Design Memorandums are considered pertinent to initial management, public use, and continuing resource management at the project. These are:

NO.	TITLE	DATE APPROVED
1	Design Memorandum on Hydrology	January 1962
2	Design Memorandum on Site Selection	February 1961
3	General Design Memorandum	January 1963
	Supplement No. 1 to Design Memorandum 3	December 1964
4A	Preliminary Master Plan	April 1963
5	Design Memorandum on Real Estate	September 1963
6	Design Memorandum on Outlet Works	June 1963
7	Design Memorandum on Embankment, Spillway and Other Facilities	June 1963
8	Design Memorandum on Power and Utility Lines and Highway and Road Relocation	October 1963
9	Design Memorandum on C&W Railroad Relocation	September 1964
10	Reservoir Clearing	June 1972
11	Sedimentation and Degradation Ranges	June 1971
12	Relocation of Antonio Lopez Ditch Facilities	. . . . .

SECTION II - PROJECT DESCRIPTION

2-01. Location and Accessibility. The Trinidad Lake Project is located in Las Animas County in southcentral Colorado near the city of Trinidad (pop. 9,901 - 1970 census), County Seat of Las Animas County. Trinidad is about 12 miles from the southern Colorado State line and nearly due south of Denver. The project is located on the Purgatoire River, about 2.75 miles upstream (southwest) from the city. Highway access to Trinidad from the north and south is via Interstate 25 and from the east via U.S. 350 and U.S. 160, these highways permitting fairly direct access from northern and eastern Colorado as well as from New Mexico, Kansas, Oklahoma, and Texas. Highway access to the project is via Colorado State Highway 12 from Trinidad, or by State Secondary Road 238 from the I-25 Starkville exit south of Trinidad. Interstate 25 is the most important highway of Las Animas County and southern Colorado. The highway is the backbone of the Colorado Urban Chain, linking the major cities along the Front Range from Laramie, Wyoming through Fort Collins, Denver, Colorado Springs, Pueblo, Walsenburg, into Las Animas County, through Trinidad, then over Raton Pass to Raton, New Mexico, and on south to Santa Fe, Albuquerque, Las Cruces, and El Paso. Four railroads provide freight and passenger service for Trinidad, although one, the Colorado and Wyoming Railroad, is a private coal hauling line (Colorado Fuel and Iron Corporation) and transports coal from its Allen Mine above Vigil down the Purgatoire River Valley to Trinidad and then on to the steel mills in Pueblo. Only the Atchison, Topeka and Santa Fe Railroad handles passenger service, on the Amtrak schedule. Two major buslines serve Trinidad and, although the County owns a public airport near Trinidad, it is not a scheduled stop for any major airline.

2-02. Description of Project Area. Geographically, the area is the southern extension of the Colorado Front Range and is characterized as being a transition zone between the Rocky Mountains and the Great Plains. The immediate project area is characterized by a narrow river valley bordered by mountainous foothills. Small irregular patches of irrigated cropland and pastures line the reticulate (braided) channel of the Purgatoire River, and pinon-juniper woodland cover the confining and highly dissected foothills. To the west and northwest the foothills rise to the steep 14,000 foot peaks of the Culebra Range, from which the Purgatoire River emanates. To the east, the rough hills blend into rolling, grassed plains, and the river gradually levels and widens. It is in this valley, starting immediately east of the city and extending downstream for about 25 miles, that irrigated farming has developed. Immediately south of the city, Fisher's Peak, the dominant and unique feature of the landscape, rises to

an elevation of 9,586 feet. The Spanish Peaks (El. 13,610 and 12,669 feet), located northwest of the project area, are isolated, twin peaks of igneous origin and are significant landmarks in the southwest.

Total relief of the project area is well over the height of the dam. The reservoir formed will be relatively narrow and will extend about 5 miles upstream of the dam.

The project area and environs consist primarily of cattle and sheep ranches with small irrigated farms along the Purgatoire River. Principal crops produced are alfalfa, corn, sugar beets, and some grain sorghum.

2.03. Fee and Easement Guide Taking Lines. The real estate acquired is in conformance with criteria in Engineer Regulation 405-2-150. The Federal Government has acquired the necessary rights, fee or easement, to all land below elevation 6,263 (3 feet above the flood control pool), lands required for project structures and operation, and lands for public use and access. Taking lines are blocked out along minor sectional subdivision lines. The acquisition plan insures public access to project waters at all times. Land acquired for project purposes consists of 3,542.04 acres in fee and 190.93 acres in flowage easements. Included in the fee-acquired lands are approximately 365 acres that are specifically designed for recreational purposes. About one-half of the lands specified for public use are too rugged topographically to provide suitable sites for construction of facilities but are highly desirable for open areas, scenic value, low-density recreational use, and wildlife utilization. Easement lands are located in the upper arms of the flood control pool, areas that will only rarely experience inundation.

2-04. Clearing and Removals. Six small villages (Piedmont, Sopris, St. Thomas, Jerryville, Sopris Plaza, and Viola) with a combined population of about 1,505 (354 families) have been acquired and structures removed.

The project includes several relocations. This involves about 6 miles of State Highway 12, 6 miles of county road, 9 miles of the Colorado and Wyoming Railroad, 4.5 miles of telephone lines, 6.2 miles of powerlines, 9.5 miles of water supply lines, Jansen Reservoir (4.5 million gallons) and Carpios, Longsdale, and Lave Plot Cemeteries (630 graves).

The upper limit of flush clearing will be at elevation 6,200. The pool level will be at or below elevation 6,200 approximately 90 percent of the time. Therefore, the retention of native trees above this elevation will aid in perpetuating the aesthetic quality of the area. The lower limit of flush clearing will be

at elevation 6,138, 5 feet below the top of the permanent pool. All trees and concrete bridge abutments below this elevation will be topped at that elevation.

2-05. Engineering Features. Trinidad Dam will be of rolled earthfill construction and have a crest length of 6,860 feet. Maximum heights of the embankment above the riverbed and the floor of Frisco Canyon will be 200 and 100 feet, respectively. The outlet works are located on the right side of the Purgatoire Valley adjacent to the present river channel. This feature consists of excavated approach and exit channels, a gated intake structure, a single barrel, high pressure conduit, and a terminal flip bucket structure. The 10-foot diameter, gate-controlled conduit will carry water 1,563 feet under the dam. The spillway will be located on the left abutment off the northern end of the embankment. It will be a 1,000-foot wide, rock cut, uncontrolled emergency spillway containing a centrally-located 40-foot wide notched service spillway with ogee section. Discharges will be conveyed through a natural arroyo and an excavated channel to the Purgatoire River located about 800 feet downstream from the dam. Pertinent project data is presented in the Pertinent Data Sheet.

2-06. Reservoir Shoreline, Length, and General Character. Reservoir shoreline lengths at 4 elevations are:

ELEVATION		LENGTH (In Miles)
6260	(Flood Control Pool)	29.8
6228.4	(Irrigation Pool)	18.2
6200	(Approx. 5-year Pool)	14.8
6142.8	(Proposed Permanent Pool)	5.4

The shoreline will vary in character with changes in surface elevation. At the top of the flood control pool, elevation 6,260, the shoreline will feature rugged slopes ranging from a 50-foot drop per 100 feet near the dam to a 100-or-more-foot drop per 100 feet at other points on the reservoir, these being generally confined to the north side. The south shoreline will be entirely separated from the hills by the relocated Colorado and Wyoming Railroad.

At elevation 6,228.4, the ultimate height of the irrigation pool, the north shoreline will remain much the same as at the flood pool level, being closely associated with the steep, pinon-juniper clad slopes. Slopes on the south shore will be somewhat less steep, and the shoreline will be withdrawn only a few hundred yards from the relocated railroad.

The proposed permanent recreation pool elevation of 6,142.8

will retain a rather steep and hilly shoreline on the north. The view to the south will feature a rather barren strip nearly a quarter of a mile wide, sloping at about 5 feet per 100 feet.

The relocated railroad will be included in all views to the south being situated at the foot of the low, wooded mountains in the background.

2-07. Pool Fluctuation. Pool levels will be gradually depleted during operation of the project, since much of the stored water would be utilized for irrigation. The level will be highest in the spring at the beginning of the recreation season (May-September) as a result of storing runoff for irrigation and flood control. Water stored for flood control purposes will be released to the level of irrigation storage as rapidly as possible. Subsequent releases will be made for irrigation storage on demand until the permanent storage level is reached. This will occur sometime during the recreation season about every other year. Initial elevation of the permanent pool would be 6142.8, which would increase to 6192 after 75 years of depletion by sediment deposition. Consequently, the operating range between the top of irrigation pool and the permanent pool would vary from 85.6 feet initially to 30.4 feet ultimately. The elevation of the 5-year flood pool is 6203. Pool size duration data is presented in Table I for the initial condition prevailing prior to sediment deposition. Area capacity data for Trinidad Reservoir is shown in Table II.

TABLE I

POOL SIZE - DURATION DATA
INITIAL CONDITION

STORAGE (Ac-ft)	ELEVATION (ft)	AREA (acres)	DURATION DURING RECREATION SEASON (percent)
4,500	6142.8	213	100
14,300	6171.8	486	50
24,500	6190.82	752.3	23
63,500	6228.4	1,421	1

2-08. Reservoir Elevation Frequency and Duration Curves. The 33-year period 1925-1957 was used for analysis to determine pool frequency and duration curves. The reservoir was operated on a monthly basis to supply irrigation demands. Individual flood periods were operated on a daily basis to determine the maximum storages. The annual and seasonal maximum and minimum storage (in acre-feet) were then analyzed by standard statistical methods. The storages for various recurrence periods were then converted to elevations for both initial conditions and for conditions after 75 years of sedimentation. These curves are presented on Plates 1 and 2.

The duration curves, also shown on Plates 1 and 2, were computed using the end of the month storages for all but the upper 5 percent of the curves, which was based on the daily values computed during flood periods. These storage values were then converted to pool elevation for both initial and final conditions of sedimentation.

2-09. Reservoir Operation. Trinidad Dam and Reservoir will be operated for flood control, irrigation, and recreation. The reservoir will be regulated for control at the Trinidad gage. Regulation will be in such a manner as to secure the greatest practicable benefits from the use of the flows of the Purgatoire River consistent with the operating principles shown in Section VIII of Appendix B of the Arkansas River Basin Master Regulation Manual.

Waters stored in the flood control pool will be released at the maximum nondamaging rate. Further, floodwaters will not be released until such time as uncontrolled flows below John Martin Dam are reduced to nondamaging flows. Irrigation releases will be made by the Resident Manager in accordance with requests from the Purgatoire River Water Conservancy District. Any inflow, other than that stored for irrigation use, temporarily stored below the bottom of the flood control pool for flood control purposes will be released at such a rate, time, and quantity as may be ordered by the State Engineer of Colorado but restricted to nondamaging flow rates in the channel downstream from the reservoir. There will be no releases of water from the permanent pool except upon the request of the State Engineer of Colorado.

Figure 2. General view of project area. Tower of outlet works is located slightly to the left of the middle of the photograph.

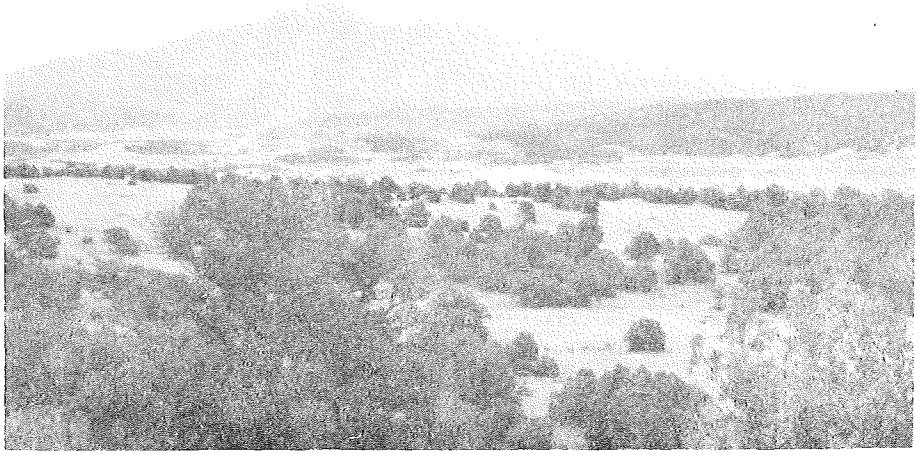


Figure 3. Carpios Ridge Recreation Area. Open area on left hand side of photograph planned for picnicking. Open area to the right for camping.

Figure 4 and 5. Typical setting within the Carpios Ridge Recreation Area.

Figure 5. Carpios Ridge Recreation Area.

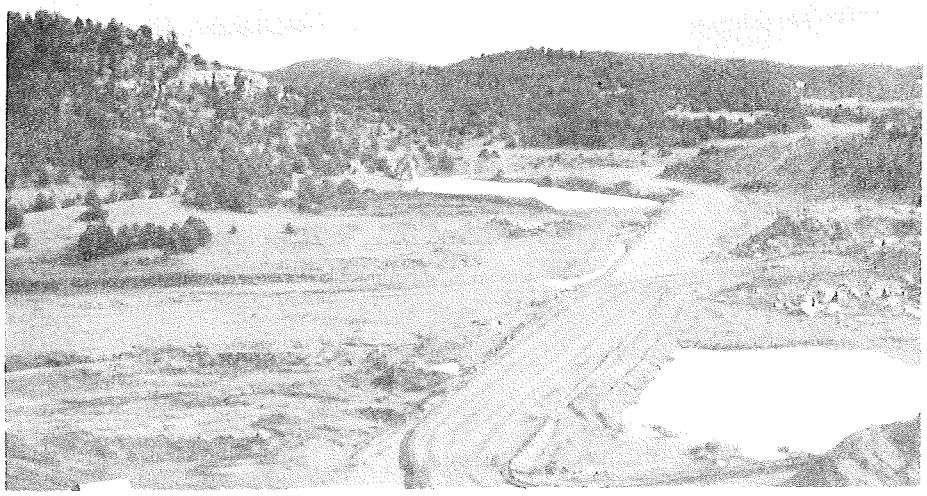


Figure 6. Long Canyon. Site recommended for wildlife habitat development.

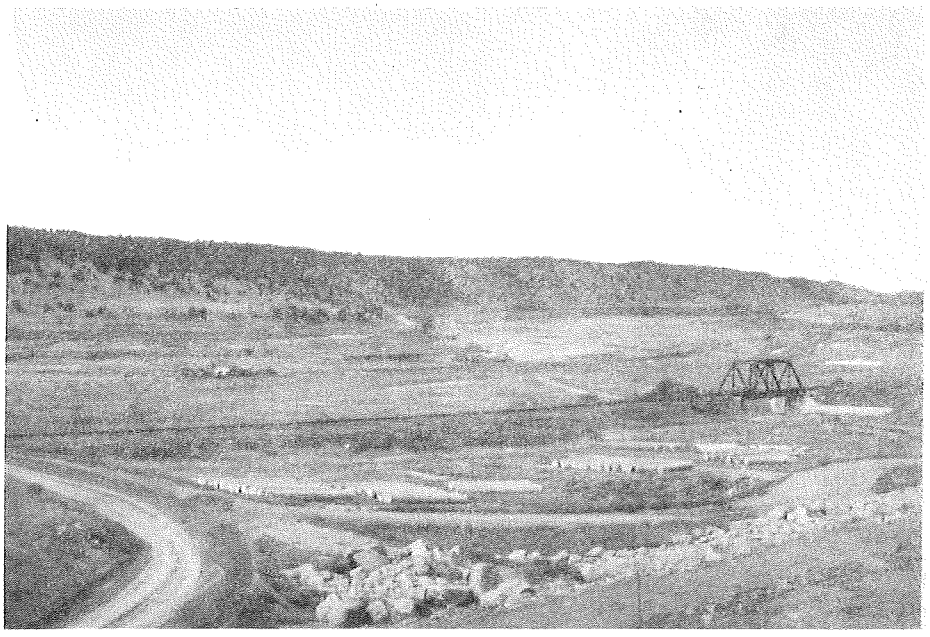
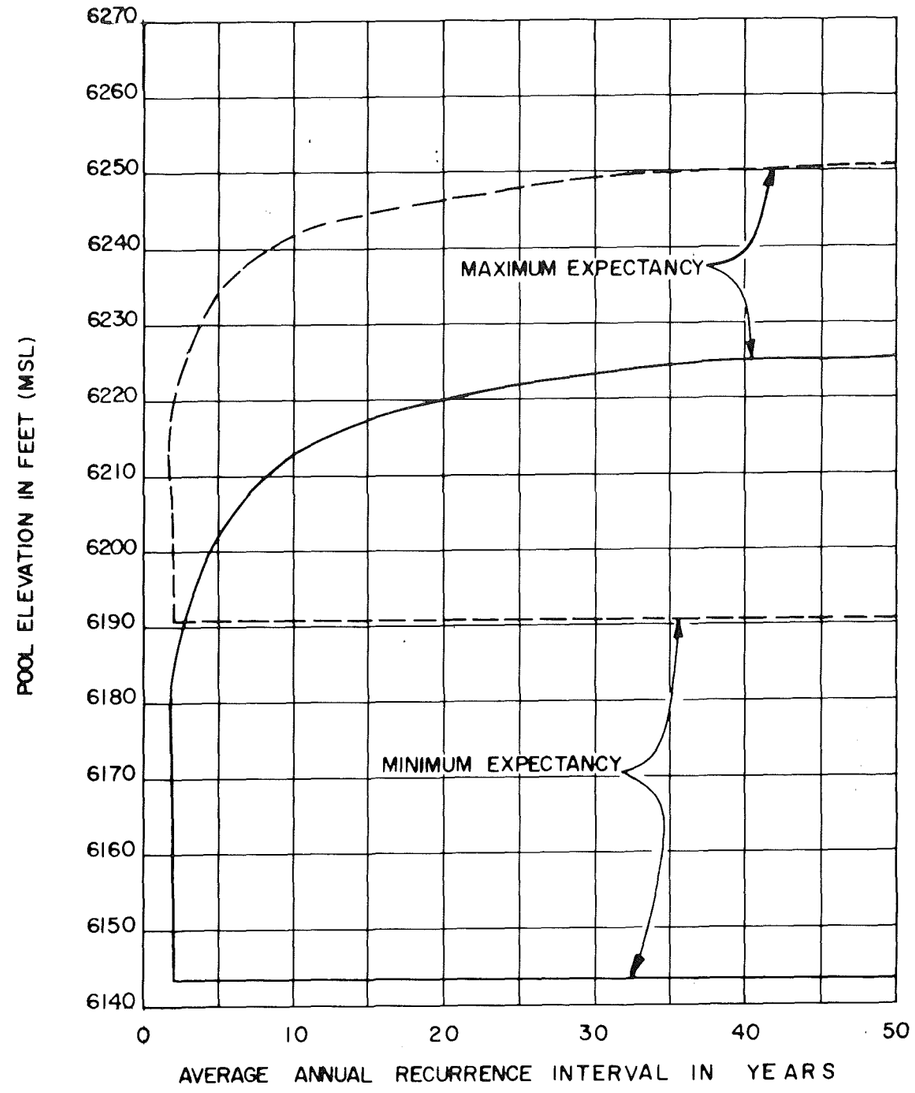
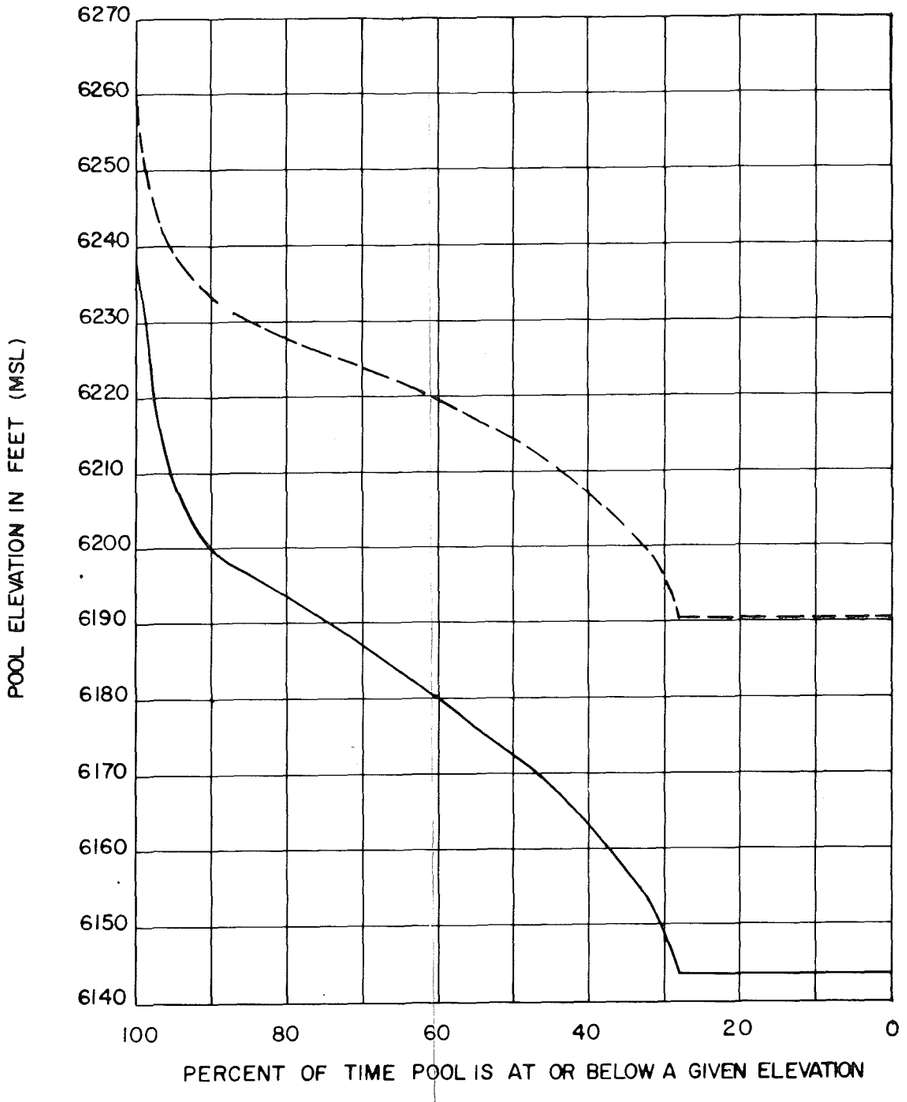


Figure 7. Upper view of the upper reservoir area at the junction of Long Canyon and the Purgatoire River.





LEGEND

——— INITIAL CONDITIONS

— — — ULTIMATE CONDITIONS

ARKANSAS RIVER WATERSHED PURGATOIRE RIVER, COLO.
TRINIDAD LAKE PROJECT

SEASONAL POOL ELEVATION PROBABILITY AND DISTRIBUTION CURVES (MAY – SEPTEMBER)

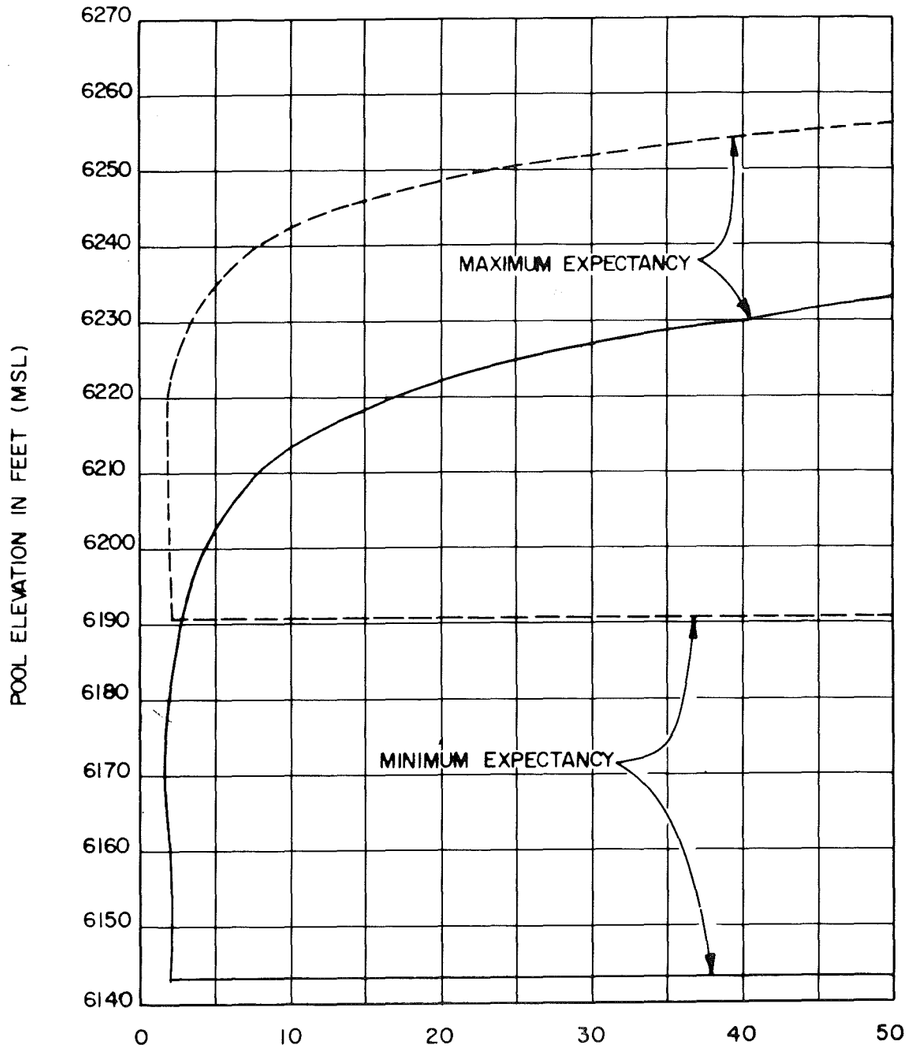
SCALE: AS SHOWN

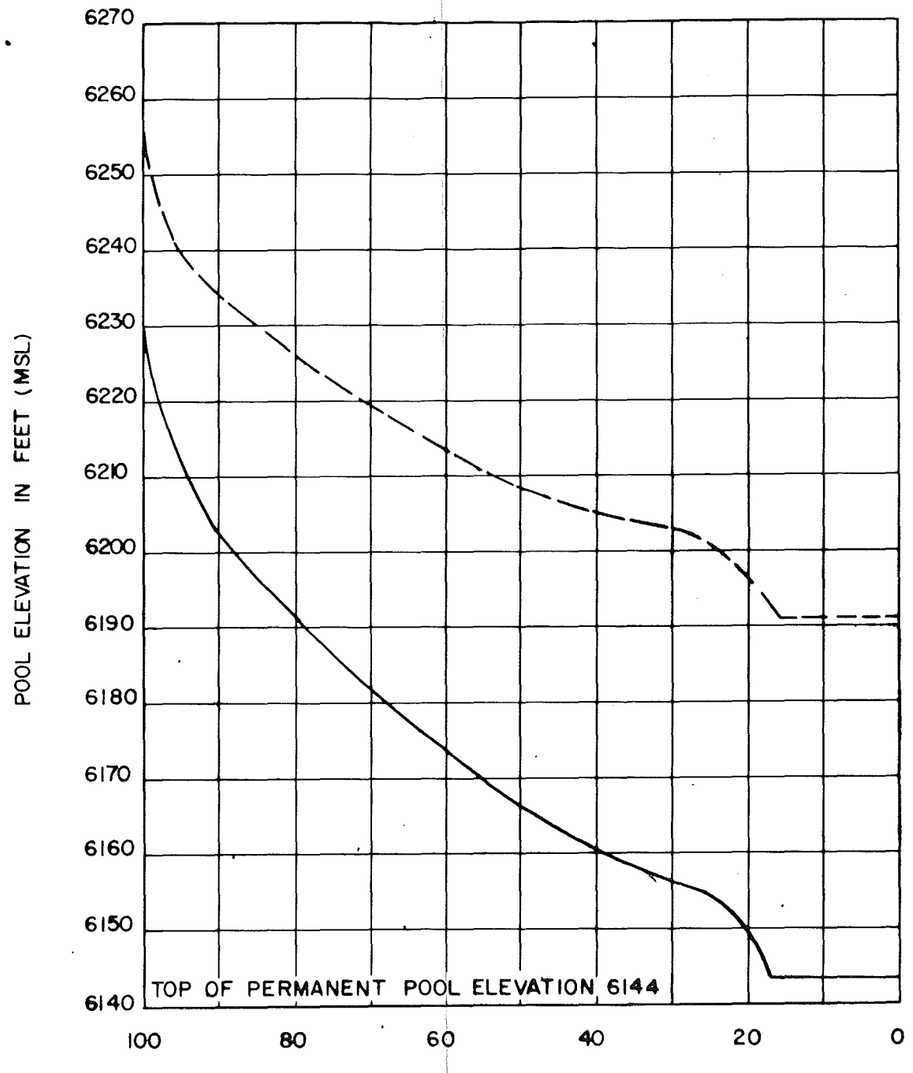
TO ACCOMPANY DESIGN MEMO 13 TRINIDAD LAKE MASTER PLAN	FILE NO.
DATED:	ARR-DM-PM-4

PLATE 1

CORPS OF ENGINEERS

U.S. ARMY





LEGEND

——— INITIAL CONDITIONS

– – – ULTIMATE CONDITIONS

ARKANSAS RIVER WATERSHED PURGATOIRE RIVER, COLO.
TRINIDAD LAKE PROJECT

ANNUAL POOL ELEVATION PROBABILITY AND DISTRIBUTION CURVES

SCALE: AS SHOWN

TO ACCOMPANY DESIGN MEMO 13
TRINIDAD LAKE MASTER PLAN
DATED:

FILE NO.
ARR-DM-PM-5

PLATE 2

TABLE II

TRINIDAD RESERVOIR
AREA-CAPACITY DATA (BASED ON 1966 TOPOGRAPHY)

Elevation Ft.	Area Ac.	Volume Ac.Ft.	Elevation Ft.	Area Ac.	Volume Ac.Ft.	Elevation Ft.	Area Ac.	Volume Ac.Ft.
6,081	0	0	6,160	359	9,339	6,242	1,693	87,478
6,084	2	3	6,162	378	10,076	6,244	1,733	90,904
6,086	3	8	6,164	398	10,852	6,246	1,778	94,415
6,088	4	15	6,166	419	11,669	6,248	1,820	98,013
6,090	5	24	6,168	441	12,529	6,250	1,866	101,699
6,092	6	35	6,170	464	13,434	6,252	1,912	105,477
6,094	8	49	6,172	488	14,386	6,254	1,961	109,350
6,096	10	67	6,174	514	15,388	6,256	2,010	113,321
6,098	12	89	6,176	540	16,442	6,258	2,058	117,389
6,100	16	117	1,178	566	17,548	6,260	2,107	121,554
6,102	21	154	6,180	593	18,707			
6,104	27	202	6,182	620	19,920			
6,106	33	262	6,184	650	21,190			
6,108	40	335	6,186	680	21,854.5			
6,110	48	423	6,188	710	22,520			
6,112	56	527	6,190	740	23,910			
6,114	65	648	6,192	770	25,360			
6,116	74	787	6,194	801	26,870			
6,118	83	944	6,196	832	28,442			
6,120	93	1,120	6,198	864	30,075			
6,122	102	1,315	6,200	896	31,771			
6,124	111	1,528	6,202	928	33,531			
6,126	120	1,749	6,204	962	35,355			
6,128	129	2,008	6,206	997	37,245			
6,130	139	2,276	6,208	1,033	39,204			
6,132	149	2,564	6,210	1,072	41,234			
6,134	160	2,873	6,212	1,112	43,339			
6,136	171	3,204	6,214	1,150	45,523			
6,138	183	3,557	6,216	1,188	47,785			
6,140	195	3,935	6,218	1,226	50,123			
6,142	207	4,337	6,220	1,263	52,537			
6,144	221	4,765	6,222	1,299	55,028			
6,146	235	5,221	6,224	1,336	57,588			
6,148	250	5,706	6,226	1,374	60,223			
6,150	266	6,222	6,228	1,413	62,933			
6,152	283	6,771	6,230	1,453	65,720			
6,154	302	7,356	6,232	1,494	68,586			
6,156	321	7,979	6,234	1,535	71,533			
6,158	340	8,640	6,236	1,576	74,562			
			6,238	1,615	77,673			
			6,240	1,653	80,864			
					84,132			

SECTION III - CONSTRUCTION PROJECTS - STATUS

3-01. Project Development Under Way. Construction of the Trinidad Lake Project was initiated on 2 May 1968 and, as of June 1975, approximately 71 percent of the overall project was complete. Land acquisition and relocation of major project relocations are essentially complete or nearing completion. Approximately 79 percent of embankment work has been completed.

3-02. Scheduled Development Completion Date. Closure of the dam is scheduled between September 1975 through March 1976 and the project is scheduled to become fully operational (exclusive of recreation facilities) in December 1976. Construction of recreation facilities is scheduled to begin in July 1976 and to be completed in December 1977.

SECTION IV - ENVIRONMENTAL AND RECREATIONAL RESOURCES OF THE PROJECT AREA

4-01. The Setting. The area within which the project is located is characterized by a heterogenous assemblage of environmental elements. A diversity of land forms and plant distribution is quite evident. Geographically, the area is characterized as being a transition between the Southern Rocky Mountain and the Great Plains Physiographic Provinces. This merging of land forms has created an area which expresses not only features and communities of two adjacent and largely distinct bio- and geographical areas but contains a unique complement of biotic species and community relationships of its own--the transitional ecotone. East of the foothill region of the Trinidad area are the high, short-grass, rolling plains--a vast area of relatively uneroded sedimentary formations broken only by an occasional mesa and canyon. In the Trinidad area itself, at the well defined verge between mountain and plain, the terrain breaks into hills and valleys, where the vegetal mantle is pinon-juniper (predominantly pinon pine) rather than grass and sage. Ascending steadily westward into the mountains, elevations rise to over 14,000 feet, and the pinon-juniper woodland transitions through forests of pine, spruce and fir to the dwarfed and windtrained vegetation of the hostile environment above timberline. The mountains are drained by the Purgatoire River, which courses through a rapidly descending narrow valley and, after bisecting the city of Trinidad, emerges into the plains and irrigated cropland east of the city. Immediately south of the city, Fisher's Peak, a table-top (mesa) mountain, rises to an altitude of 9,586 feet and is the dominant and unique feature of the landscape. The Spanish Peaks, located northwest of the project area, are twin conical mountains (el. 13,610 and 12,669 feet) of igneous origin and are one of the significant landmarks in the southwest.

The city of Trinidad is a community of 9,901 people (1970 census), a majority of whom are employed in agriculture, mining, manufacturing, and government.

4-02. Climate. While climatic conditions vary considerably between the high mountains and valleys, the climate of the basin is largely semiarid. The climate of the general Trinidad area is characterized by intense local thunderstorms during July and August, heavy snowfall from November through April, and frontal or cyclonic-storm rain during May. Average annual precipitation varies from approximately 30 inches in the high mountains to 12.25 inches at Las Animas, the terminal end of the basin located 100 miles to the northeast. Average annual precipitation at Trinidad is 17.23 inches, including an annual snowfall of 60

inches. Heavy snowfall is general in the mountainous area of the upper Purgatoire River watershed. In these higher elevations, the fall and winter precipitation generally occurs as snow, which does not produce appreciable runoff until the spring months.

Temperatures are characteristic of a high altitude, dry continental climate with low relative humidity. The average annual maximum and minimum temperatures at Trinidad are 66.1 and 36.8 degrees Fahrenheit, respectively. The diurnal temperature range is relatively high, averaging about 34 degrees. Absolute extremes are 110 and minus 32 degrees Fahrenheit.

4.03. Geology. The project is located on the eastern flank of a broad subsidence (syncline) known as the Raton Basin. This basin extends northward from the vicinity of Las Vegas, New Mexico, into Huerfano Park, southern Colorado, and lies between the northly-trending Sangre de Cristo Mountains on the west and the northeasterly-trending Sierra Grande arch on the east. The subsidence occurred somewhat prior to, but mainly concurrent with, the uplifting of the Sangre de Cristo Mountains. The Sangre de Cristo Range is basically a simple igneous uplift comprising part of the Rocky Mountain Chain. The uplift occurred during the Laramide Revolution, which marked the end of the Mesozoic and the commencement of the Cenozoic eras some 60 million years ago. As a result of the subsidence, strata on each flank of the basin dip toward the center. The supply of sediments was sufficient to continually fill the basin and, consequently, the strata thickens from the basin edges toward the center. Beds of the Vermejo and Raton formations dip and thicken greatly westward from the damsite into the reservoir area and beyond the center of the basin. These two formations have extensive coal beds and have been intensively mined in the vicinity of Trinidad. The development and growth of Trinidad have been directly related to the presence, availability, and demand of coal.

The Spanish Peaks, located some 30 miles northwest of the project in the San Isabel National Forest, are of geologic and historical significance. The Spanish Peaks are prime examples of "stocks", which are large masses of igneous rock which intruded layers of sedimentary rock and were later exposed by erosion. Among the most unusual features of these peaks are the great dikes which radiate out from the mountains like spokes of a wheel. These walls of rock are often spectacular in height and length. In fact, Stonewall Gap, located up the valley is a dike that radiates far from the peaks proper. These peaks, because of their geological significance, have been recommended by the staffs of the Pike and San Isabel National Forests for designation by the Secretary of the Interior as natural landmarks.

Fisher's Peak, part of Raton Mesa, is an erosional remnant of a high plains area which was developed during late Quaternary time. Capped by layers of basalt, these mesas resisted the erosional forces which wore down the softer material that surrounded them, thus producing prominent geologic features. Because of this prominence, Raton Mesa is listed in the National Registry of Natural Landmarks.

Fossilized plant and animal forms have been noted within project lands and, more specifically, within the recreation areas themselves. While no protective or extensive interpretive efforts are recommended, certain interesting specimens will be included in the interpretive displays in the visitors' lobby.

Interpretive displays of regional land forms and geologic features (especially the coal beds) as described above are planned for the visitors' lobby. Displays of this type will increase one's awareness of the unique geologic features and enhance his appreciation of the area.

4-04. Archeologic and Historic. Early man has left abundant evidence of his occupation of the project vicinity. Since government acquisition of project lands, salvage archeology has been conducted by the Trinidad State Junior College, Anthropology Department, under contract with the National Park Service. The Corps of Engineers is currently funding the salvage of two remaining archeological sites in the reservoir area. These operation sites have yielded and are yielding much evidence of the life and culture of early inhabitants. Reports of early archeological investigations have been submitted to the Corps for information purposes, with more recent reports being submitted in response to the Corps funded contract with the National Park Service.

With the completion of current salvage activities all cultural resources within project boundaries will have been identified and mitigated, thus satisfying all Federal laws and orders for the protection of historic or prehistoric remains. It is currently envisioned that interpretive displays, utilizing artifacts uncovered during salvage activities, will be made part of the visitor program in the visitors' lobby.

Evidence of Trinidad's early days and the cultural influence of several ethnic groups that came to this coal-rich region is still to be found throughout the area. There are five sites in the vicinity of Trinidad listed on the National Register of Historic Places: Baca House and Outbuilding, Frank G. Bloom House, Corazon de Trinidad, Jaffa Opera House, and Raton Pass (a crossing point for the Mountain Branch of the Santa Fe Trail).

The State Historical Society of Colorado lists four additional historic sites that are near the project area. These are Madrid Plaza, a Penitente morada, and the communities of Cokedale and Sopris. Mr. Stephen Ireland, former professor of anthropology at Trinidad State Junior College, has listed three additional sites, located on private land, in close proximity to, but outside project lands (note Plate 3), as worthy of historical importance and has taken the preliminary steps to have them included in the National Register of Historic Places. These sites are the Cokedale coke ovens, a Penitente morada, and the northern boundary of the Beaubien and Miranda (Maxwell) Land Grant. If elected, these sites will probably draw considerable attention, both because of their newly elected status and because of their proximity to the lake.

As previously mentioned, Raton Pass once served as a crossing point for the Mountain Branch of the Santa Fe Trail. From a camping and resting area in the vicinity of Trinidad this trail left the Purgatoire River to begin the steep and arduous ascent up Raton Pass and then continued down into New Mexico to its destination, Santa Fe. Since the Santa Fe trail did not pass close to project lands, present day remnants of this trail will not be affected by project operations.

4.05. Ecologic. The pronounced diversity of habitat among the mountains, foothills, river valley, and plains is reflected in the ecological variety to be found in Las Animas County and within the general project area. Mountains and plains support biotic communities that are largely distinct from one another, and the ecotones (transition zones) between biomes have species derived in part from contiguous areas and also contain unique species of their own. The varied topography of the general project area--foothills, mountains, canyons, plains, perennial streams, rock outcroppings, exposure, and land modification by man--along with soil factors and climate, contribute to the diversity of biotic species; and, accordingly, govern the structure, distribution, abundance, and interrelationships of the biotic community.

Within the immediate project area the biotic community has been significantly altered by man and his activities. Urban development, mining, and agriculture have significantly limited, altered, or exerted a selective influence on plant and animal species.

Prior to project construction a majority of lands destined for project purposes were in private ownership and ranged in character from a semi-urban to rural setting. Six small communities, evolved from old coal mining camps, were located on the river terraces in the lower portion of the project area. Upstream from these communities a few small, irregular fields of irrigated crop-

land shared the riverine environment with deciduous vegetation of willow, groves of cottonwood, alder, boxelder, chokecherry, and locust. Grasses and shrubs covered the intervening terraces between the river and the confining foothills. Lands not cultivated or developed serve as pasture, range, and/or wildlife habitat, with riparian woodland providing aesthetic enhancement and additional wildlife cover. To either side of the narrow valley pinon-juniper-clad hills rise abruptly from the valley floor. Density of this woodland varies from moderate to dense, accompanied by sparse-to-dense understory grasses with some woody shrubs. Land use of this woodland biome is range for livestock and habitat for wildlife.

In years past, when there existed a greater demand for coal, mining activity was common to the area, and an occasional mine entrance (all sealed in project area) and tailings still exist as evidence of the industry that once flourished here.

Away from the developed area, the land becomes more isolated and open and acquires a "wild" atmosphere.

Prior to project construction, lands in the vicinity of the project area provided habitat for a relatively small wildlife population which, in turn, provided a limited amount of hunting opportunity. Farther up the valley and in intersecting canyons, opportunities increase for hunting small game and big game (deer, turkey, bear, and elk). Fishing opportunities are available in the upper reaches of the Purgatoire River but do not exist in this lower stretch. Occasionally, waterfowl use the river and provide some limited waterfowl hunting. It can be expected that when the permanent pool is established, greatly expanded fishing opportunities and habitat, although primarily resting habitat, for waterfowl and shorebirds will be available.

The combination of dam construction, resultant inundation, recreation development, and general intensification of activity will significantly alter the appearance of pre-project lands. Most of the preproject riverine flora and animal life will be displaced by a lake-type ecosystem. While it can be said that abiotic elements and community relationship will have been significantly altered within a majority of project land, the degree of change cannot be applied to the general area. The nature and size of the project are not of the magnitude to precipitate changes of regional impact. Also, preproject land and resource use had significantly changed the original character of the area.

It is not anticipated that recreational activity would significantly disturb biotic communities and relationships in

contiguous areas, since most of the surrounding land is in private ownership and access will not be readily available. However, any future land-use change could alter present conditions.

Project management and land use will probably not have a major impact on existing ecologic relationships within the general area, although existing ground cover will require careful maintenance and protection to prevent serious deterioration from overuse. In this vein, an awareness of all natural resources and their well-being will be an integral part of project resource management. It will be an objective of the proposed development to control visitor use and retain as much as possible the natural character of the area, and both the design and operation of the development should be thus oriented.

A secondary impact of the project that could definitely have an adverse impact on the wildlife community is that of transferring water from Model Reservoir to Trinidad Lake. This action could dry up the marsh below the Model Dam, with a resultant loss of a wetland type ecosystem. This loss assumes greater importance when such habitat is located in a contrasting environment, i.e. semiarid plains-mountain environment, thus greatly enhancing species variety and community complexity. The Corps of Engineers, and the Colorado Division of Wildlife are currently attempting to prevent this adverse impact through the transfer of Project acquired water rights to Model Reservoir.

4.06. Environmental and Scenic Qualities. The terrain in the project area is quite varied and considered to be aesthetically appealing. Total relief at the project site significantly exceeds the height of the dam, with rising hills and towering mountain inclosing the river valley. To the south rises Raton Mesa and Fisher's Peak, to the east the Culebra Mountain Range, and to the northwest the Spanish Peaks. The Purgatoire River, riparian vegetation and groves of cottonwood, along with the bordering grassed terraces, combine with the wooded hills and distant mountain peaks to produce a visually appealing setting. Two overlooks, one in the Trinidad Recreation area and the other on Carpios Ridge, will offer commanding views of the lake, with Fisher's Peak in the background. The Trinidad overlook will offer a more unrestricted view of the entire surrounding landscape.

The floral community represented in and adjacent to the project area can be divided into two generally distinct associations: that of the valley floor (flood plain and terrain) and that of the surrounding hills. On the valley floor, deciduous riparian vegetation consisting of small-to-medium size groves of cottonwood trees, willows, and Siberian elm follow the sinuous stream. The cottonwood is numerous not only along the Purgatoire River

but along its major tributaries. Wild plum, chokecherry, currant, rose, raspberry, box elder, alder, elderberry, and locust also make up the riverine flora. Outside cultivated land, grasses (blue gramma, Indian rice grass, brome, bottlebrush squirreltail, three-awn, foxtail, sand dropseed, reed grass, wheatgrass, little and big bluestem, needle and thread, galleta, wild rye, cord grass, meadow fescue, and cheat grass), and woody shrubs (four-wing saltbush, soapweed yucca, prickly pear and cholla cacti, sage, skunkbush, winterfat, and rabbit bush) cover the flood plain and adjacent terraces. Because much of the project area was previously occupied by small towns and utilized as pasture and cropland and also by the mining industry, much of the developing vegetation is in a seral stage and can not be considered as climax. This association abruptly terminates at the base of the hills, where the pinon-juniper woodland becomes dominant.

This woodland occupies a wide belt between grassland and the heavier conferious forests of higher altitudes and has a sufficiently distinctive biota to be considered a biome. Floral species in this association include a moderate-to-dense overstory of pinon pine and one-seeded and Rocky Mountain juniper. The pinon pine is dominant and averages about 15 feet tall. A few open, grassed parks are scattered throughout the woodland. Height and density of plants in this area are significantly influenced by exposure, increasing on slopes with a northern exposure and decreasing on slopes with a southern exposure. The more common understory growth includes: grasses (blue and sideoats grama, Indian rice-grass, sand dropseed, three-awn, little bluestem, western wheat grass, and ring muhly); forbs (fleabane, sunflower, wild onion, groundsel, gumweed, penstemon); and woody shrubs (mountain mahogany, sage, Gambel's oak, soapweed and serviceberry), including cacti (prickly pear, and cholla). The extent of this understory vegetation ranges from sparse to moderate.

As stated, wildlife resource values within the project area are relatively low. Mammalian species that commonly utilize (utilized) the general project area as habitat or as part of their habitat include small-to-moderate numbers of rodents (mice, rats, gophers, squirrels, chipmunks, muskrats, and porcupines); shrews, cottontails, ringtails, bats, weasels, mink, Rocky Mountain mule deer, beaver, bear, skunks, raccoons, badgers, foxes (red, swift, and gray), bobcats, and coyotes. Abundant elk and mountain lion populations are to be found higher up the Purgatoire River valley. There is no fishery in this section of the Purgatoire River. Flash floods, turbidity, sandy substraturm, low flows, scarcity of pools for cover, limited food production areas, and lack of a suitably vegetative shoreline severely limit the presence and development of aquatic life. The benthic community is quite limited, and what few fish are present consist of a few suckers and minnows.

Generally, the quality of surface waters above Trinidad is good. Water flowing into the city is influenced or degraded primarily by natural geochemical processes, the agricultural industry, past and, perhaps, current mining activities, and the influence of small, localized areas of human habitation or utilization. Large amounts of suspended sediments are present during periods of precipitation or runoff, indicating the erosive nature of the watershed. Also, water quality data give some indication that the numbers of coliform bacteria in the river are higher than allowable standards for body contact sports. While numbers of potentially harmful bacteria are normally reduced by retention in lakes and impoundments, the source of these contaminants should be controlled. Specific source points are not known, although animal waste (difficult to control) and the presence of small, scattered areas of human habitation, visitation, and commercial use in the upper reaches of the Purgatoire River suggest potential pollution sources.

4-07. Recreation. Trinidad Lake is a newly-developing project which currently offers no recreational use of project lands, except for sightseeing from a semi-developed overlook near the left dam abutment.

The city of Trinidad is without adequate neighborhood recreation and park facilities. The few recreation facilities that do exist are of a large scale, not easily accessible by many of the people, especially the very young and old. One can see an interesting direction of development in the city: on one side the commercial and civic activities expanding toward the river and, on the other, the cultural, community functions encroaching into the freeway/river belt. The potential for a unique recreational center appears great.

SECTION V - FACTORS INFLUENCING AND CONSTRAINING RESOURCE DEVELOPMENT AND MANAGEMENT

5-01. General. The combination of dam construction, water storage, recreation development, and increased visitor activity will have a significant and permanent influence on the environmental resources and utilization of the general project area. There will be a major transformation of the area. Many existing features will be eliminated or modified and new elements and relationships added or substituted. Ramifications of project features will be, in some instances, projected beyond the immediate project area and experienced or manifested in a variety of ways.

5-02. Demographic. Approximately 15,744 people inhabit the 4,794 square miles of Las Animas County, averaging about 3.3 persons per square mile. Of this number approximately 62.9 percent live in towns, with Trinidad being the major urban center. Approximately 11,600 people live in the Trinidad Metro Area. The county's current population represents a decrease of 21.2 percent from the 1960 population of 19,983, or an average yearly decrease of 2.12 percent, the rural area accounting for a majority of the decrease. The city of Trinidad's population suffered a decrease of 7.4 percent from the 1960 population of 10,691. The population decline has been a trend that began after 1920, when the coal mines began to close down and employment in the county declined. The rate of decline during the last decade is approximately the same as the rate of decline from 1950 to 1960. The population loss is due to fairly steady out-migration in adjustment to the decrease in available jobs.

The economic history of Trinidad, as well as that of Las Animas County, has been directly correlated with the demand for coal. There has been a steady decline in Trinidad's population and employment opportunities after the 1920's, when the demand for coal decreased and the mines began to close down. The county seems to have gone into an economic shock, from which it has been slow to recover. The source of the problem is that the economic base has remained undiversified. Because of its long-time dependence on the coal mining as its major source of income, it was difficult to quickly shift its economic base in order to employ the displaced miners.

Primary employment is in agriculture, mining (coal), manufacturing, and government. The production of beef cattle is the principal agricultural activity. The Colorado Fuel and Iron Corporation's Allen Mine, located about 30 miles west of Trinidad, is the County's largest industry, employing about 450 men. The

County's secondary employment consists of retail and wholesale trade and personal services. Employment in agriculture and mining has substantially decreased during the past 20 years. The median annual income for the city of Trinidad is $5,991 (1970 census) as compared to $6,055 for Las Animas County and $9,555 for the State of Colorado. Approximately 22.4 percent of families in Trinidad have incomes less than poverty level.

The labor force participation rate has steadily declined since 1960. This is the result of a deterioration in the following conditions: the high proportion of persons in the county who are over 65, dependence on coal mining and agriculture, no development of new industries, and high dependence on public assistance.

The skill levels of the Las Animas County labor force are low, many laborers being unskilled or semi-skilled. There have been practically no new jobs requiring skilled labor created during the last decade, and those that become skilled soon leave the County. The bulk of those leaving are young people who are unable to find employment in the area. As a result, 40 percent of the population is 45 years old or older. There is evidence of much underemployment in the area.

New, varied primary industries must be attracted to Las Animas County in order to take the place of the coal mining industry as a major source of income, so that the county can begin to solve some of the economic ills which currently exist. Trinidad State Junior College, tourism and recreation, the Trinidad Lake Project, numerous government programs aimed at stimulating and upgrading the area, the current development of an industrial park, together with existing growth resources, and abundant reserves of coal with good coking and low sulfur qualities, hold the potential for a very favorable economic future.

While the ethnic structure of the population in the vicinity of the Project is distinctive (Note Exhibit 2), efforts to identify recreational activities preferred by any ethnic category could not be made. The city of Raton, Colfax County, New Mexico, is located about 21 miles south of Trinidad and has a population of 6,862. While the political boundary of the New Mexico - Colorado state line will primarily influence fishermen from this area, Raton will contribute to the expected visitation at Trinidad Lake.

The city of Walsenburg, located about 37 miles northwest, has a population of 4,329 and will also contribute to recreational demand.

Climatic conditions are quite favorable and, although located near the mountains, Trinidad does not often experience the severe climatic extremes that are found in the higher altitudes.

5-03. Topography and Geology. To a certain extent, the relief and geology of areas to be developed for public use will influence facility arrangement, use, and, perhaps, design. The area is hilly, some side slopes being quite steep and rocky. Most of the project is situated on rock formations overlain by varying depths of overburden. Some rock excavation will be necessary for facility installation. Recreation areas have been sited to utilize relatively level terrain. The Carpios Ridge Recreation area is located on a wooded mesa; however, some of the side slopes are rocky and quite high and steep. The Trinidad Recreation area varies from fairly level or sloping hill terrain to rugged rock outcrops. The Piedmont Group Recreation Area is situated on nearly level or gradually sloping terrain.

Many of the soils within the reservoir area are in the Table Mountain and Fort Collins series. These soils have loamy surfaces and are easily cultivated. Much of the area above the high water level is within the Louviers-Prieta and Travessilla series. These soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife. They are susceptible to erosion and exhibit past erosional damage. Rocky outcroppings are also characteristic of this series. Concentrated foot traffic in and adjacent to the recreation areas will soon denude and disturb the soils, rendering them highly susceptible to wind and water erosion. Also, the sloping character of the terrain will accelerate the rate of soil transport. While surfaced roadways, parking spaces, and trails will reduce the degree of erosion, management procedures will include measures to reduce soil disturbance or to repair areas of constant wear.

5-04. Accessibility. Highway access to Trinidad from the north and south is via Interstate 25 and from the east via U.S. 350 and U.S. 160. Highway access to the project is via Colorado State Highway 12 from Trinidad or by "old" State Secondary Road 238 (County Primary 41) from the I-25 Starkville exit south of Trinidad (see Figure 2). The Colorado Department of Highways has plans to reconstruct that portion of State Highway 12 between the section relocated by the Corps and Trinidad. Upgrading of this section combined with the relocated section, will provide excellent highway access to the project. It is anticipated that the "old" State Secondary Road 238 will receive considerable visitor traffic from motorists exiting or approaching Interstate 25. This road is an older road, approximately 20-22 feet wide, and is in need of repair. The road should be reconditioned to meet current standards if it is to adequately handle the anticipated recreation traffic.

5-05. Area of Influence. Projections show 90 percent of

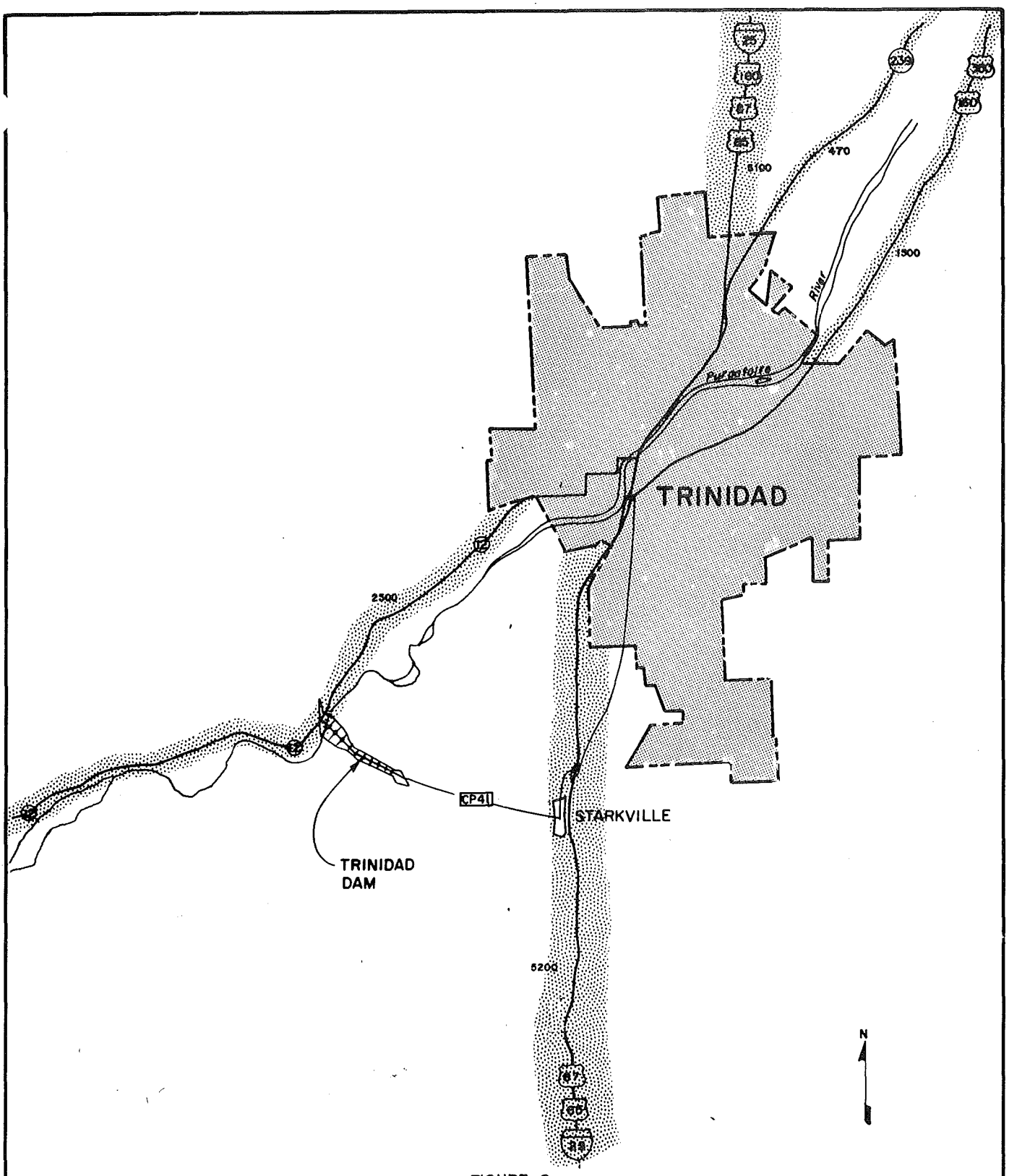


FIGURE 8
Vicinity of
TRINIDAD LAKE PROJECT

Colorado's future population residing in the front range plains-foothills belt. All recreation resources available to residents of this belt are of prime significance to Colorado.

Trinidad Lake will primarily attract people living within a 50-mile radius. However, many visitors from distances beyond 50 miles will also be drawn to the lake. The gross estimated population within a 50-mile radius of Trinidad is approximately 33,000. Within the 50-75 mile travel zone the estimated population is about 96,000. The city of Pueblo, located approximately 86 road miles north of Trinidad, has a population of about 97,450 and is the only other major city that could be considered in the area of influence. However, the presence of the newly created Pueblo Reservoir immediately adjacent to the city will significantly influence visitation from the area. Also the proposed Fountain Lake near Pueblo should provide a major recreation resource. Studies indicate that water of a quality suitable for recreation and fish and wild life can be stored in a permanent pool. Because both Colorado Springs and Denver are relatively distant from Trinidad (127 and 197 miles respectively) and the proximity of water-associated recreation areas to these cities, it is thought that these population centers would not significantly contribute to visitation at Trinidad Lake.

Two major geographic factors will influence total visitation and activity participation rates at Trinidad Lake. The first is the nearby political boundary between Colorado and New Mexico. Of the population within a 50 mile radius of the project, about 9,900 (29.7%)live in New Mexico.

The Sangre de Cristo range of the Rocky Mountain chain rises to the west of Trinidad Lake. Persons living in or beyond the mountains are less likely to regard Trinidad Lake as a major recreation source for most activities. The 3,900 Colorado residents of this zone comprise another 11.8% of the 50 mile radius population.

Census figures for population centers within or near the zone of influence show continuation of the national trend to urbanization, with rural and smaller city population loss.

TABLE III

POPULATION TRENDS

	1970	1960	Percent of Change
Trinidad	9,901	10,691	-7.4
Las Animas County	15,744	19,983	-21.2
Pueblo	97,453	91,181	+ 6.9
Raton	6,962	8,146	-14.5
Colfax County	12,170	13,806	-11.8

Theoretical projections for the Southeast Colorado Recreation Region in which the project lies show the following examples:

(A) Unsatisfied Demand for Outdoor Recreation Thousands of Activity Days

	1970	1980	Multiple
Hiking and Walking	1,326	2,216	1.6
Picnicking	620	1,203	1.9
Trailer Camping	84	216	2.6
Tent Camping	6	97	16.1
Hunting	361	612	1.7

(B) Examples of similar projections for the Metro-Region (Urban belt) are:

	1970	1980	Multiple
Hiking and Walking	26,106	52,422	2.0
Picnicking	7,915	20,198	2.6
Trailer Camping	3,990	7,817	2.0
Tent Camping	1,581	3,691	2.3
Hunting	2,703	52,232	1.9

The primary visitation market area considered within a 50-mile radius, for activities such as picnicking, boating, fishing, water-skiing, small game and bird hunting, and sightseeing, is the local one. Visitors from outside this local area will also participate in these activities, but most of this group will be nonresidents whose principal onsite activities are sightseeing and camping. Most campers will come from out of state or from beyond the 100-mile radius. Because of the project's proximity to Interstate 25, the demand for camping facilities is expected to be considerable. Within this camper group will be found the greatest number of potential hikers, nature watchers and photographers and history enthusiasts.

5-06. Related Recreational-Historical Areas. A variety of both natural and man-made recreational resources are to be found within the vicinity of Trinidad. The varied topographical and geological features, which include plains, foothills, and high mountains, combine with grassland, woodland, forest, and perennial streams to offer a unique combination of recreational resources and potential.

Approximately 36 to 40 road miles west of Trinidad on State Highway 12 in the forested mountains of the Culebra Mountains are Monument and North Lakes (Note Figure 1). Those small lakes are owned and operated by the city of Trinidad and are used for municipal water storage and recreational activities. Monument and North Lakes have capacities of 2,200 and 1,000 acre-feet, respectively. These lakes offer fishing, boating, picnicking, camping, some hunting, hiking, and nature observation. Rental cabins are available. Neither speed boating nor water skiing is permitted at the two lakes. Boating at North Lake is restricted to boats of 10 horsepower or less. Monument and North Lakes are stocked by the Colorado Division of Wildlife and contain, respectively, populations or rainbow and brown trout, kokanee salmon, and a few western white suckers, and cutthroat and brook trout. Stream fishing opportunities are available on the upper stream section of the North Fork of the Purgatoire River. With the exception of this section of stream and Monument and North Lakes, almost all waters in the general region are privately owned. The scenery through the Stonewall-Cucharas Pass country is of superb quality.

The San Isabel National Forest lies a short distance beyond the previously described area. Four recreation sites, Bear and Blue Lake Camp Grounds (15 units each), Cuchara Camp Ground (26 camping and 3 picnicking units), and Spring Creek Picnic Ground (11 units), lie about 70 miles from Trinidad. Additional attractions of the National Forest include high mountain scenery of the first order, hiking, big game hunting, snow play, and nature study.

Model Reservoir, as stated, is a small, privately-owned reservoir used for the storage of water for irrigation and is located about 12 miles northeast of Trinidad. This area, including the small marsh below the dam, provides moderate hunting for waterfowl, small game, and upland birds, particularly in favorable water years. With the transfer of water rights from Model Reservoir to Trinidad Lake, this area may likely face desication and coincident loss of wildlife. To preclude this possibility, the Colorado Division of Wildlife and the Corps of Engineers are pursuing the possibility of transferring a portion of water rights obtained by the purchase of project lands. If this effort is successful, wildlife resources can be preserved and enhanced in this area.

Lathrop State Park, located about 3 miles west of Walsenburg (40 miles north of Trinidad), contains about 1,014 acres of land and 100 acres of water area. Recreational facilities and opportunities available are picnicking (6 shelters), camping (79 units), boating, waterskiing, hiking, fishing, horseback riding, and golfind. Annual visitation was 324,352 during 1973, a 33.7 percent increase over 1972, although a 16 percent decrease over 1970 visitation. The developing of Trinidad Lake will influence visitation here and, conversely, Trinidad visitation will be influenced by Lathrop State Park. Environmental differences between the two and personal likes and dislikes will determine public choice.

Pueblo Dam and Reservoir is being constructed on the Arkansas River about six miles west of Pueblo, Colorado, by the Bureau of Reclamation. The reservoir will have a permanent pool of 1,286 surface acres and a conservation pool of 4,646 acres. Extensive recreational development is planned with an estimated annual visitation of 980,000 visitor days. The distance between the two developments, nearly 100 miles, significantly diminishes competition, as does the character of the area and the experience to be derived from each.

A number of recreational attractions within 50 air miles distance are to be found in New Mexico. Residents of New Mexico Recreation District 2 within the 50 mile radius have adequate, if less than abundant fishing resources. There are not less than eight small lakes with a total of about 1,200 surface acres which are available to the public. In addition, about 50 acres of private reservoir water offers limited availability, and about 300 surface acres of private water in the Vermejo Lakes is highly restricted. About 60 miles of stream fishing is also very restricted on the Vermejo ranch, and about 50 miles of stream fishing is available elsewhere in the 50 mile zone, mostly with some limitation on public access.

Species available to the New Mexico fishermen within or just outside the 50-mile radius from Trinidad Lake include brown, rainbow, cutthroat and brook trout; largemouth bass; northern pike; channel catfish and bluegill. Because of an adequate fishery readily available within the state, the number of New Mexico fishermen who will choose to pay nonresident fees to fish at Trinidad Lake is expected to be minimal.

The 1971 New Mexico Statewide Comprehensive Outdoor Recreation Plan indicates that basic resources for water skiing, boating, and camping in District 2 are considered adequate through the year 1990. Fishing resources are similarly classified with an emphasis on management and development. Visitation from New Mexico for these activities will also be limited and may be

influenced by registration requirements or fee systems.

Seasonal horse racing in nearby Raton currently has a significant impact on overnight lodging in Trinidad. It is anticipated that this activity will influence camping demand and water-associated activity pressure at Trinidad Lake. Also, Mt. Capulin National Monument, featuring the most perfect cone and crater of any extinct volcano in North America, is located a few miles east of Raton. This Monument contributes to the total tourist drawing power of the region and will correspondingly have an impact on visitation at Trinidad Lake.

Historical resources of the area, while varied, abundant, and highly interesting, are not expected to be primary tourist-drawing interests but, rather, will complement and enrich the visitor's stay in the area.

5-07. Reservoir Operation and Public Use. The Trinidad Lake Project will be operated primarily for flood control and irrigation. Water levels will fluctuate widely during operation of the project, since much of the stored water will be released for irrigation purposes. The level will be highest in the spring at the beginning of the recreation season. As a result of storing runoff for irrigation, any flood water stored would be released as fast as possible to the level of irrigation storage. As pool levels diminish due to irrigation releases, the area of lake floor exposed will correspondingly increase. Shoreline use may be somewhat impaired during drawdown periods, and the scenic attractiveness may diminish. These mid- and late-season drawdowns could very well diminish public utilization of the lake area.

5-08. Sitings of Road, Cemetery, and Utility Relocations, or Mineral Extraction Facilities. These factors do not have an important impact at present. Although there are some mine tailings in the project area, it does not appear that they will have a direct bearing on recreation development. Careful management will avoid future problems of this nature.

5-09. Borrow and Spoil Areas. A majority of the main construction borrow areas are located within the area to be flooded, and it is not anticipated that recreational development will be significantly influenced by these activities. However, excavated spoil material from the spillway has been deposited in Carpios Canyon in the immediate vicinity of the Trinidad and Carpios Recreation Areas. While this material may not physically interfere with construction of recreation facilities, it is a very visible intrusion and alteration of an area that will be heavily utilized by the public. Restoration will be required to regain an aesthetically attractive and useful area.

5-10. Water Quality of Pool and Tailwater area. Generally, the quality of surface waters above Trinidad is good. As the Purgatoire River descends from its headwaters in the high mountains towards the plains, water quality is gradually influenced or degraded, primarily, by natural geochemical processes, the agricultural industry, past and, perhaps, current mining activities, and the influence of small, localized areas of human habitation or utilization. Water quality data indicates that the water in the upper reaches of the watershed is of suitable quality for use on a potable water supply and cold water fishery. Water flowing into the reservoir will be suitable for a cold water fishery, irrigation, and industrial uses. However, the stream does not meet standards for body contact sports, the number of coliform bacteria being somewhat higher. Specific point sources of contamination are not known, although the presence of several small localized populated and developed areas strongly suggest potential sources. It is expected that this pollution element will be reduced or eliminated in the lake, since impoundments often act as bacteriological filters, concentrating bacteria of potential public health danger in a localized area until numbers are naturally reduced.

While numbers of coliforms should be lessened in the lake through natural limiting factors, the source(s) of these contaminants should be controlled to avoid any potential health hazards. The disposal of sewage in the Purgatoire River above the lake should be prohibited, since an excessive nutrient supply can cause an eutrophication problem, resulting in adverse effects to the aquatic community as well as to water quality and water utilization. It is anticipated that the Colorado Department of Health will monitor the lake's waters for any potential health hazards and take any necessary control measures.

5-11. Adaptability of Structures for Public Use. With the exception of the Visitor Center in the Operations Building, project structures have no potential for adaptation to unrelated public use.

The Project Office and associated facilities used during the construction phase of the project will be retained by the Corps of Engineers as part of its operations and maintenance program.

5-12. Pre-project Exploitation of Timber and Mineral Resources. The effect of past coal mining activity in the area is not expected to significantly influence public use. As stated, there are some coal tailing piles in the area, and all known mine openings have been sealed. No threat to public safety is apparent.

5-13. Anticipated Uses, Visitor Demand and Needs.

A. Principal Activities. Demand is anticipated at Trinidad Lake for boating, water skiing, fishing, swimming, picnicking, camping, hunting, and sightseeing. Some opportunity for walking, hiking, sledding, snowmobiling, and nature study will also be available.

B. Projected Visitation. Initial and 5-year visitation projections are discussed in Exhibit 1. Initial project visitation is expected to fall within the range of 120,000 to 145,000 annual visitors. The 5-year planning period target estimate of 150,000 annual visitors is used in computing facilities requirements for initial development. Actual visitation will depend upon several factors. Low-average income in the 50-mile zone, ethnic influences (Exhibit 2), unforeseen geographic factors (Exhibit 1), variable local public response (Exhibit 1), the proximity of Interstate Highway 25, national economic conditions, and energy availability will provide a range of influence.

1. Five-year planning period activity levels are estimated in Exhibit 3, Tables 3-1, 2, 3, and 4, and are summarized in Table IV below.

TABLE IV

PROJECTED AVERAGE MONTHLY ACTIVITY DAYS

ACTIVITY	APR	MAY	JUN	JUL	AUG	SEP
Camping	1,290	2,300	3,533	5,130	4,170	1,320
Picnicking	1,290	2,880	5,888	7,695	5,213	1,980
Swimming	0	960	1,884	2,565	1,558	264
Fishing	6,450	6,720	5,888	5,130	3,127	1,980
Boating	323	768	1,413	1,796	1,668	660
Sightseeing	5,160	6,720	7,065	7,182	6,047	5,280
Water Skiing	0	16	1,696	1,411	1,334	1,135
Other	65	461	236	205	271	53
Total A.D.	14,578	20,825	27,503	31,114	23,498	12,672
Est. Visitation*	12,900	19,200	23,550	25,650	20,850	13,200

*From Ex. 3, Table 3.

2. Facility needs in this plan are based on the above estimates and the requirements of Engineering Manual 1110-2-400. However, due to monetary restrictions, full facility development to completely satisfy the five-year planning period will not be

possible. Rather, a slightly lower level of development will be employed. This level should suffice for the near future, with additional expansion proceeding as visitor load dictates and funds permit.

Facility needs are computed and discussed in the following section and summarized in Table V. Facilities that will be provided initially are also shown and so indicated.

C. Facility Requirements.

1. Visitor Center. A small visitors lobby, 29' x 14.5', will be provided in the Operations Building. This facility can serve as a visitor center during the current planning period. Five years of observation and experience will provide a reliable basis for additional facilities in the first updated Master Plan. Suitable exhibits, i.e. archeology, history, geology, fish and wildlife, and project information, are to be provided in the Visitor Center (See concept plan in Exhibit 4).

2. Overlooks. Observation areas are to be provided in the Trinidad and Carpios Ridge Recreation Areas. These are to be open terrace areas with suitable parking and safety barriers (Plates 6 and 15). The present overlook facility (partially developed) in the Trinidad Recreation Area near the north abutment of the dam is to be improved and available for free public use. This overlook will be operated and maintained by the Corps of Engineers.

3. Boating Areas. Policy governing public use of the lake's surface water, with the exception of certain areas required for operation of the dam, will be established jointly by the Colorado Division of Parks and Outdoor Recreation and the Corps of Engineers. Certain types of water craft and boating activities, e.g., power boating and water skiing, can reduce other boating activities because of the need for a larger boating area and, because of the lake's small size, certain limitations, e.g., area or time zoning, boat size and activity, may have to be imposed.

a. Launching Facilities. Determination of the need for launching facilities is based on a consideration of the anticipated demand, public safety, and evidence of adverse environmental impacts.

Estimation of number of lanes to be provided is based on the percent of time the pool is at or above a given elevation during the May-September period and the application of the Colorado Division of Parks and Outdoor Recreation standard of 10 acres per boat. The 50 percent pool, that elevation at which the pool will

c. Floating Dock. It is contemplated that a floating dock system of the type manufactured by the United McGill Corporation will be provided at the launch ramp. This type of dock is suited to the fluctuating water levels that will characterize the lake and is favored by the Colorado Division of Parks and Outdoor Recreation. The dock will be approximately 54 inches wide by 24 feet long.

d. Sanitation. A dual vault toilet, such as used by the Colorado Division of Parks and Outdoor Recreation, will be provided near the launch/parking area.

4. Picnic Areas. Picnic facility needs were computed on the basis of criteria in EM 1110-2-400, Appendix A. Modification of EM criteria is exercised when dictated by local or regional circumstances.

a. Tables. The above EM suggests three methods for determining the number of picnic tables needed at Trinidad Lake.

Utilizing all three mathematical options, the average number of tables required was 36. Utilizing a turnover rate of 1.5 and a unit capacity of 4 approximately 216 picnickers can be served. Approximately 20 percent (7) of the picnic sites at Trinidad Lake are to be equipped for multiple family use while retaining some suitability for separate family use.

b. Shelters.

(1) Individual. Since tree height and density are not sufficient to provide adequate shading, each picnic table will be provided with an individual shelter.

(2) Group. The group picnic shelter standard of 1 shelter per 225 normal summer weekend day picnickers indicates that 2 group shelters should be provided. Each group shelter will be equipped with 8 portable tables, thus providing an additional 16 tables with a normal service capacity of 64. No turnover rate is assumed. Thus, the total number of picnic shelters and tables to be provided will be:

Single-table shelters - 36
Eight-table shelters - 2

From this total of 52 tables, approximately 280-300 picnickers can be accommodated.

c. Fireplaces. A ground-level fireplace (charcoal grill) will be provided for each single table. An effort will be made to disperse picnic sites, thus avoiding congestion, and sharing of

fireplaces between two picnic sites may not always be feasible. An exception to this may be those sites situated to provide for multi-family use. Realistically, there should be an ample supply of fireplaces to better service the recreationist and, as importantly, to discourage the gradual stripping and killing of surrounding pinon trees for campfire use.

d. Parking. One parking space will be provided for each picnic site. Where multiple-use facilities are provided, additional parking area will be provided. Also, pull-outs for larger, group type vehicles will be provided.

e. Trash Receptacles. One trash receptacle will be provided for each two sites and the group picnic shelter will be provided with three receptacles each. These facilities will be sited so as to facilitate and encourage use. The operating agency may wish to contract with the city of Trinidad for the use of dumpsters and disposal of solid waste in existing sanitary landfills operated by the city. Disposal of solid waste generated from Corps' facilities could be disposed of in like manner with arrangements made either with the City or the Colorado Department of Natural Resources. The latter may be more feasible.

f. Sanitary Facilities. A waterborne comfort station will be provided. Fixtures to be installed consist of:

MEN	WOMEN
2 water closets	4 water closets
2 lavatories	2 lavatories
2 urinals	
1 janitorial sink	

g. Play Area and Equipment. A small play area for young family members will be developed and supplied with play equipment such as swings, earth mounds, climbers, and slides. Safety and imagination of design will be employed where possible with major emphasis placed on terrain adapted design, thereby utilizing the available resource and providing the youngster with an experience that is both adventurous and unique. Materials indigenous to the area will be employed wherever possible.

5. Camp Areas.

a. Tent and Trailer Camp Spaces. The standards of EM 1110-2-400 for camp site provision are 1 for each 5 individual campers on a normal summer weekend day; or 1 for each 7,500 to 10,000 annual recreation-days use; or a minimum of 50 camp spaces at a lake project.

Utilizing these criteria and weighing as many influencing factors as possible, it was shown that a total of 80 campsites will be needed over the life of the project; 50 campsites initially and 30 future. This number is compatible with the area without undue environmental disturbance. A few years of project operation and experience should provide more accurate guidance regarding the number of additional facilities that will be needed, expecially in light of current economic conditions. Both spur and pull-through spaces will be utilized, thus accommodating both trailers and campers.

(1) Facilities to be Provided.

(a) Tent Pads. EM 1110-2-400 suggests that a minimum of 50 percent of the campsites should be interchangeable to accommodate either tent or trailer camping equipment. Therefore, approximately 25 tent pads will be provided at selected campsites. Field conditions will determine the actual number of pads needed.

(b) Fireplace Circle and Charcoal Grill. One fireplace circle accompanied by some low wooden benches will be provided for group gatherings. Each campsite will be provided with a ground-level fireplace (charcoal grill).

(c) Picnic Tables. Each camp space will be supplied with a table located on a concrete wearing pad. The table used will be one of colored concrete supports with wood timbers for the seats and table tops.

(d) Trash Receptacles. One partially buried trash receptacle for each 2 campsites will be supplied. Trash receptacles should be concentrated along the road as much as possible to facilitate maintenance and keep cleanup crews out of the camps.

(e) Sanitary Facilities. In lieu of both a comfort station and a washhouse, a combination of the two will be employed. Facilities include 8 shower stalls (4 each), 4 laundry tubs (2 each), 8 lavatories (4 each), 6 water closets (2 male, 4 female), and 2 urinals. Provisions will be made to facilitate the handicapped.

One sanitary waste dumping station, including a water flushing device, will be located a short distance from the campground.

One waste water drain will be supplied for every 2 campsites. It is thought that to provide one for every 4 spaces as suggested by EM 1110-2-400 would discourage their full use.

(f) Play Area. A second children's play area will be part of the camping area plan. Design and provision of play equipment will be similar to that previously described for the other

children's play area, with an emphasis on safety and imagination of design.

The basic unit at each location will include two double swings, such as the strap-seat swing by Belson, accompanied by two slides. Half of the equipment should be specifically designed for smaller children. Nonhazardous equipment which stimulates imaginative play may be added in the future.

The potential for complicating groundskeeping should be minimized through careful selection of equipment and maintenance-conscious installation. Drainage of scuffed out areas at playground equipment sites is a usual problem and requires special consideration in siting and installation.

b. Group Camping. The Piedmont Group Recreation Area will be designed to accommodate formal organization camps and groups on a nonexclusive, short term, first-come-first-served reservation basis. Initial capacity is for 50 persons and future development will expand the capacity to 100 persons at a time in one group or two separate groups. Facilities are not to be leased or licensed to any one group (reference ER 1120-2-400, para. 16d and ER 1165-2-400, para. 9c).

(1) Facilities to be Provided.

(a) Tent Camping. Ten tent pads, each 16 feet square, (as requested by Colorado Division of Parks and Outdoor Recreation) will be sited so as to maintain an integral unit without congestion.

(b) Group Shelter. A single group shelter containing a cooktype fireplace and eight portable tables will be utilized.

(c) Sanitation. Two vault-type toilets will be employed as the development is not sufficiently large to warrant a waterborne facility. Three trash receptacles as well as two waste water drains will be located near the shelter.

6. Swimming Areas. Areas suitable for swimming are very limited at this project and designation of acceptable zones for the activity will be agreed upon by the Corps of Engineers and the Colorado Division of Parks and Outdoor Recreation. A potential average demand for 7,500 annual days of swimming is estimated (Table 3-1). The Purgatoire Point area, located on a long, low ridge just west of the boat launching ramps, though of limited suitability, may be the best apparent one at this time. Although this area is planned for limited future development, it is anticipated that some boating, swimming and picnicking will occur here. Plans for the area include vault toilets, a few

picnic tables, and a minimal access road. Future development should be based on observation of demonstrated visitor preference and appraisal of park management needs.

7. Water Skiing. A potential average annual demand for 6,000 activity-days of water skiing is estimated (Table 3-1). As with swimming, the project is not ideally suited for accommodation of this demand, and the surface level of the lake at a given time will influence location of ski take-off areas. Establishment of these locations and any time zoning of water areas for skiing will be done jointly by the managing agency and the Corps of Engineers. No special facilities for skiing are to be provided at this time.

8. Trails. A loop type trail will be constructed in the Carpios Ridge Recreation Area. This trail will not only facilitate hiking but, importantly, will provide access to the water's edge. Since this recreation area is located well above the lake and the hill sides are quite precipitous, a trail will provide a safer route down the hill. Note Plate 5 for proposed trail routing.

9. Interpretive Media. Interpretation of local and regional landforms and geologic features is strongly recommended as they are uniquely interesting, easily visible, aesthetically appealing, and quite educational. Informative material will be included in exhibits in the Visitor's Lobby in the Administration Building. This material could be complemented and enhanced with display panels at overlooks as these sites are elevated and would make for a more meaningful and effective conveyance medium. No specific protection of geologic or landform features is recommended, although operation and maintenance of the project area will generally respect and protect all types of environmental resources.

It is currently envisioned that an archeological display will be made part of the recreation program at the Visitor Lobby where artifacts recovered from salvage activities would be displayed and accompanied by interpretive information.

The small group of tepee rings in the area that will be developed as a picnic ground will be surrounded by a low, attractive protective wall of native stone accompanied by an interpretive plaque. A historical narrative of the area should be part of the interpretive program at the Visitor's Lobby. This should be accomplished with the aid of Morris F. Taylor. Mr. Taylor is a history professor at Trinidad State Junior College and is quite knowledgeable of the early history of the area. Also, the State Historical Preservation Officer should be consulted for his views and advice.

5-14. Cost Sharing Requirements. This subject has been discussed in paragraph 1-04B, page 1-2.

5-15. Environmental and Ecological Features.

A. Ecologic. Preservation and/or enhancement of existing environmental amenities and ecological relationships will be the prime factors influencing or constraining resource development. Preproject elements and relationships will undergo significant alteration resulting in a lake-type ecosystem with the effects of attendant recreational development and utilization. Design, placement and construction of access and circulation roads and recreation facilities will be accomplished so that a minimum of adverse land and biotic disturbance will occur. This concept will be held as a goal so as to provide a high quality and satisfying recreational experience while still maintaining a harmonious balance within the ecosystem. Landscaping of areas adversely altered by construction activities or requiring visual enhancement will significantly aid in enhancing the overall quality of the area.

Fireplaces (grills) will be employed at virtually all sites to encourage the use of charcoal brickets or similar fuel to avoid having trees destroyed for use as firewood.

B. Geologic. The varied topography and rocky substrata that characterizes the recreational lands will influence facility design and location. Design of recreation areas will strive to minimize the degree of excavation as it is not only costly in the monetary sense but also environmentally.

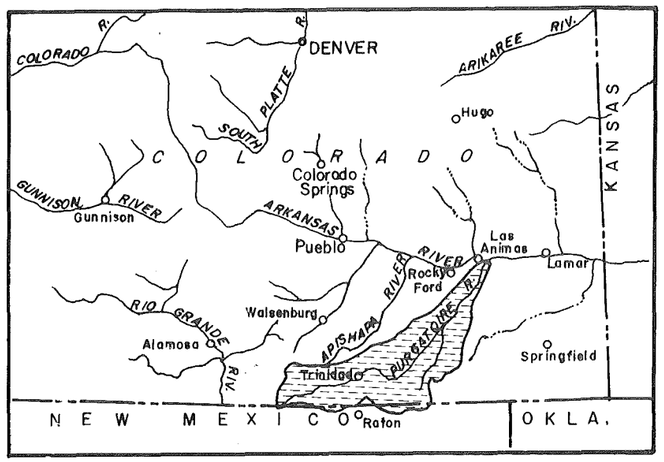
Gravel or paved trails, pads, and roadways will minimize soil disturbance and the denuding and erosional effect of concentrated foot and vehicular traffic.

C. Archeologic/Historic. Historical or archeological artifacts will be protected and subsequently developed and interpreted for public use, particularly the tepee rings located near the center of the picnic grounds.

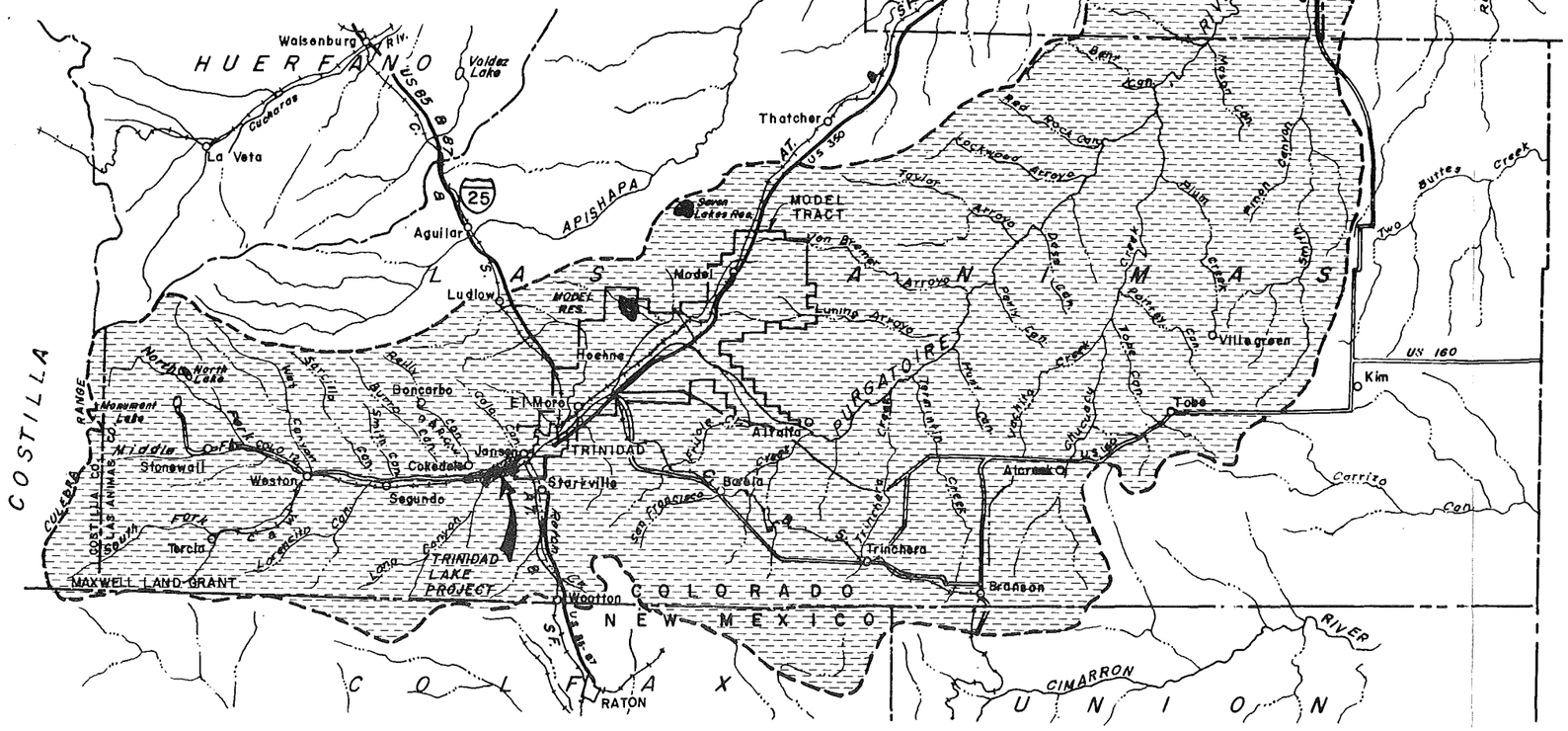
TABLE V
FACILITIES DISTRIBUTION
(ITEMS IN PARENTHESIS ARE FUTURE)

	Carpios Ridge Picnic Ground	Carpios Ridge Campground	Trinidad Overlook Area	Trinidad Launch Ramp Area	Piedmont Group Recreation Area	(Purgatoire) Point	(Carpios Canyon) Campground	Total Initial	Total Future
Picnic Table and Pad	28(22)	50	4(2)	4(2)	-	(4)	(30)	86	61
Picnic Table W/O Pad	-	-	-	-	-	-	-	-	-
Picnic Shelter	28(22)	-	4(2)	4(3)	-	-	-	36	27
Group Picnic Shelter (8-Table)	2	-	-	-	-	-	-	2	-
Group Camp Shelter (8-Table)	-	-	-	-	1(1)	-	-	1	1
Tent Pads	-	25	-	-	10(10)	-	(6)	35	16
Washhouse	-	-	-	-	-	-	(1)	-	1
Comfort Station	1(1)	-	-	-	-	-	-	1	1
Washhouse/Comfort Station	-	1	-	-	(1)	-	-	1	1
Sealable Vault Toilets	-	-	1	1	1(1)	1	-	3	2
Trailer Dump Station	-	1	-	-	-	-	(1)	1	1
Launch Ramp	-	-	-	1-3 In	-	-	-	1	-
Floating Dock	-	-	-	1	-	-	-	1	-
Overlook	1	-	1 Pt Ex	-	-	-	-	2	-
Playground (Equipped)	1(1)	1(1)	-	-	-	-	(1)	2	3
Ground-level Fireplace(Charcoal Grill)	28(22)	50	4(1)	4	-	(4)	(30)	86	56
Trash Receptacle	20(8)	25	2	2	3(3)	(2)	(18)	52	31
Waste Water Drain	-	25	-	-	2(2)	-	(15)	27	17
Water Spigot (Self Closing)	3	7	1	1	1(1)	-	(3)	13	4
Fireplace Circle	-	1	-	-	1	-	(1)	2	1
Parking Space	50(22)	50	15	50	16(16)	(4)	(30)	159	50
Trail	1		-	-	-	-	-	1	-
Fish Cleaning Station	-	-	-	(1)	-	-	-	-	1

NOTE: 20% of individual picnic tables arranged for multiple family use option.
5% of individual camper's picnic tables arranged for multiple family use option.



VICINITY MAP



LEGEND

- Dam and Reservoir
- Purgatoire River Water Conservancey District
- BASIN BOUNDARY
- County Line

ARKANSAS RIVER BASIN

TRINIDAD LAKE PROJECT
PURGATOIRE RIVER, COLORADO
GENERAL BASIN MAP

5 0 5 10
SCALE IN MILES

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

FIGURE I

SECTION VI - COORDINATION WITH OTHER AGENCIES

6-01. Introduction. Draft copies of this master plan have been submitted for review and comment to the agencies listed below. Many recommendations from these agencies are incorporated into this final master plan as appropriate. All recommendations not incorporated into the plan are responded to in statements following the respective letters. Letters of reply are included as Exhibit 6.

More intensive coordination has been maintained with those agencies that will be directly involved with the functioning of the project. This has been especially true with the divisions under the Colorado Department of Natural Resources, since they will generally administer to the public use program.

1. Federal Agencies.

   U. S. Fish and Wildlife Service
   Bureau of Outdoor Recreation
   National Park Service
   Environmental Protection Agency (no response)
   Soil Conservation Service
   Advisory Council on Historic Preservation - Boulder, Colorado

2. State Agencies (Colorado).

   Division of Parks and Outdoor Recreation
   Division of Wildlife
   Division of Water Resources
   The State Historical Society of Colorado (no response)
   Department of Health
   State Engineer (no response)
   Department of Highways
   Trinidad State Junior College - Department of Anthropology (no response)

3. Local, Institutional, Other.

   City of Trinidad (no response)
   Las Animas County Commissioners (no response)
   Trinidad Chamber of Commerce (no response)
   Sierra Club (no response)

SECTION VII - PHYSICAL PLAN OF DEVELOPMENT

7.01. Zoning of All Project Lands and Waters. Project lands and waters are to be zoned as shown on the Land Use Allocation Map (Plate 3). It is strongly recommended that project boundaries be fenced. A definition of project boundaries and the exclusion of livestock is imperative to an effective management program. Fencing should be an integral part of project construction and, as such, should be a project cost. Approximately $155,000 should be budgeted to include this project feature.

A. Zoning Water Areas. Zoning of reservoir waters for public use will be influenced by a number of factors. Of prime consideration in developing a zoning plan will be final reservoir geometry (cessation of borrow activities), water level fluctuation and duration, adaptability of bank areas for water-related activities, compatability of activities, and safety considerations. Small permanent pool size, significant pool drawdowns during the recreation season, and compatibility of recreational activities are important elements influencing water surface use at Trinidad Lake. Multipurpose use and compatibility of activities are strongly stressed.

During the initial operation of the lake, all of the conventional water uses will be allowed. This includes fishing, swimming, boating, and waterskiing. All activities will be supervised. However, of the water-associated recreational activities expected, high speed boating and water skiing are two activities that could, possibly, be incompatible with the overall recreational program. Lake size and incompatibility with other recreational activities could significantly influence these activities. At permanent pool elevation the lake will be too small to simultaneously and harmoniously accommodate more than a few high speed boats. Also, high speed boating tends to exclude or limit a number of other water-associated activities and friction often arises between high-speed boaters, fishermen, and swimmers. However, to exclude activities involving high speeds without a more accurate picture of the physical character of the lake and public participation and preference is thought to be premature at this time, and the option for some limited and supervised high-speed boating will be left open. Obviously, a time zoning plan for such activities will be necessary to prevent conflicts and safety hazards. Pool levels and seasonal preferences may exert some intrinsic control on these activities. Time periods, i.e., time of day or week, will be jointly established by the Corps of Engineers and the Colorado Department of Parks and Outdoor Recreation. Should this activity prove to be difficult to manage or be incompatible with the recreational program, it should be prohibited.

Currently, the only area that will be restricted to public use will be area surrounding the intake structure. This will be buoyed off for visitor safety.

B. Zoning Project Lands. The majority of land zoning will be rather generalized, consisting of broad classification by principal land uses. Land zoning is, to a great extent, dictated by local topography, lake geometry, and water level fluctuations.

7-02. Land Use Allocations.

A. Project Operations: As shown on the Land Use Allocation Map, all areas below the embankment (including the embankment and excepting the group camp area) are to be designated as lands required for the operation of the dam. In addition, the railroad right-of-way is to be excluded from public use, fenced, and warning signs posted in all areas that are potentially hazardous to public safety, e.g., railroad cuts, outlet works and spillway side slopes. The majority of operational lands will be continuously available to the general public for low-density recreational use and for wildlife habitat.

A small parcel of land near the entrance of the Carpios Ridge Recreation Area will be set aside for operational and maintenance purposes for the Colorado Division of Parks and Outdoor Recreation.

B. Operations: Recreation-Intensive Use. This area, as shown in Plate 3, will be the main focal point of public use and facilities concentration. Picnicking, camping, fishing, boating, games, group activities, and hiking will be the main uses throughout the life of the project. Areas chosen for development were selected for their aesthetic appeal, topographic suitability, and future expansion adaptability. Separation of activity areas was employed to the extent practicable, as were distribution and spatial relationships of individual facility sites, thus maintaining privacy and open space.

C. Operations: Recreation - Low Density Use. There are portions of project lands that will be undeveloped and retained in as natural a condition as possible. Reservation of lands in such a state adds variety and conveys to the visitor a unique feeling and experience of this particular collection of environmental elements. The topography of the area is hilly and semi-rugged, with a woodland cover, and is aptly suited for nature observation and study, non-trail hiking, snow play, and possibly some seasonal hunting. Certain portions of these areas have been designated for possible future recreational development but, during the interim period, could be utilized in a low density, semi-wild capacity. No agricultural use will be permitted.

D. Operations: Wildlife Management. A majority of the lands located at the upper end of the reservoir, in particular, the Long's Canyon Area will be designated for wildlife management area. Wildlife resources in this area are rated as good and, where possible, measures will be taken to perpetuate and enhance this valuable resource. Developments, as envisioned by the Colorado Division of Wildlife, would consist mostly of a series of low contour dikes and would not interfere with reservoir operations. The Colorado Division of Wildlife, in cooperation with the Corps of Engineers, will govern all wildlife resources at the project and enhance wildlife habitat where possible. Grazing of these lands is not recommended although some food production to benefit wildlife may be possible.

E. Natural, Ecological Areas. No lands have been specifically designated as natural ecological areas; however, those previously noted low-density areas are semi-wild in character and aptly suited for such purposes.

F. Historical Areas. No areas have been designated as historic sites on project lands. However, there are two historical areas in the immediate project vicinity, the Cokedale coke ovens and a Penitente morada. These two sites may receive National Register status and, if registered, will be of local recreational value.

G. Other Featured Areas. No areas so designated.

H. Interim Use. No areas so designated. No agricultural use is recommended.

I. Additional Land Requirements. At the present time, no additional land requirements are foreseen.

J. Environmental Resources. Other than what has been previously discussed, no areas are so designated.

TABLE VI

LAND ALLOCATION ACREAGES

Designation	Approximate Acreage
Project Operations	422 (excluding RR R/W)
Operations: Recreation - Intensive Use	539
Operations: Recreation - Low Density Use	729 (including RR R/W)
Operations: Wildlife Management	918 (including RR R/W)

7-03. Project Structures Site Plan. The Site Plan (Plate 4) depicts those areas that have been selected for project administration. The main feature is the operations building, which will contain the project office, serve as a maintenance and storage facility, and house a small visitor lobby.

A small tract located near the entrance to the camping and picnicking areas has been reserved to provide a facility site used in the administration, operation, and maintenance of recreation developments.

7-04. Recreation Site and Area Plans. Site plans of the various recreation areas are shown on Plates 5, 6, and 7. These plates depict the overall arrangement of the planned facilities as well as those areas proposed for future development. Table VI lists the land allocations and the approximate acreages of each.

7-05. Schedule of Recreational Development. Based on present project funding and anticipated work progress, initial recreation facility development will be completed about 8 months after completion of the dam. Construction of the boat launching ramp will be completed prior to storage of the permanent or conservation pools. Future development will be contingent upon future recreation demand. Table VII presents the proposed construction schedule for initial recreation facilities.

7-06. Cost Estimates. The detailed recreation cost estimate is located in Section XI, as is the Comparison of Estimates.

TABLE VII

SCHEDULE OF RECREATIONAL DEVELOPMENT

CALENDAR YEAR	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
FACILITY																								
Trinidad Rec Area							———																	
Carpios Ridge Rec Area									———															
Piedmont Group Rec Area																				———				
Water Supply System																				———				

SECTION VIII - FACILITY LOAD AND OTHER DESIGN CRITERIA

8-01. General. The physical plan of development for the recreation facilities is presented in Section VII. This section establishes specific design criteria for the recreation facilities. Design criteria and guidelines presented in Engineer Regulation 1110-2-400 and Engineer Manual 1110-2-400 and the following will be used in development of the contract documents.

8-02. Siting. Siting of a majority of recreational facilities will be based on recent aerial photographs, substantiated by actual field siting. This method will guarantee the best utilization of space and tree cover. All structures at the Carpios Ridge Recreation area will be located above the top of flood control pool, elevation 6260. At the Trinidad Recreation Area, all structures except the boat launching ramps will be sited above the initial seasonal 5-year frequency pool, elevation 6200.

8-03. Access and Circulation Roads. Except for the Piedmont Recreation Area, all access and circulation roads will have a 1-1/2 inch hot mix surface course, a 6-inch stabilized aggregate base course, and a 6-inch subbase course. The access and circulation roads in the Piedmont Recreation Area will be surfaced with 6 inches of gravel. Typical sections and details for the roads are shown on Plate 8. Alignment of the roads will conform to the natural contours to minimize cut and fill. Final layout of the roads will be field sited, and clearing of existing vegetation will be carefully controlled.

8-04. Basis of Design. Design of the recreation access and circulation roads is generally based on criteria contained in Table 1, TM 5-822-2. Class D roads, two-lane, mountainous, criteria were followed for the roads except that the speed on one-way paved roads will be 15 MPH. Pertinent standard design criteria are listed below:

DESIGN CONTROLS AND ELEMENTS	CLASS "D" ROAD TWO-LANE, MOUNTAINOUS
Design speed, mph	35
Average running speed, mph	30
Minimum width of traffic lane, ft.	10
Minimum width of shoulders, ft.	4
Absolute maximum degree of curve where snow and ice are factors, degrees	16-1/2
Pavement widening for curves sharper than 11°, Ft.	2

(Continued)

DESIGN CONTROLS AND ELEMENTS (Continued)	CLASS "D" ROAD TWO-LANE, MOUNTAINOUS
Desirable maximum grade, percent	6
Absolute maximum grade for permanent installations, percent	9

Traffic signs will be in compliance with the Manual of Uniform Traffic Control Devices for Streets and Highways. Drainage structures are to be in accordance with TM 5-820-4 utilizing a peak frequency discharge of 25 years for the access roads and 10 years for the circulation roads.

8.05. Pavement Design. The flexible pavement design for the recreation access and circulation roads, shown on Plate 8, is based on criteria contained in TM 5-822-2, TM 5-822-5, and TM 5-818-2.

Subsurface investigations for the recreation areas and access roads were not conducted for the Trinidad Lake Project. Results of subsurface investigations for other project features have been presented in previous design memorandums (DM-3, General Design Memo; DM-6, Outlet Works; DM-7, Embankment, Spillway and Other Facilities; DM-8, Design Memorandum of Relocations). Based on investigations for the embankment and other facilities, subgrade for the roads will be classified generally as sandy clay (CL). In this classification, California Bearing Ratio values would range from 5 to 15. No laboratory CBR tests were performed for the design of the roads. Based on previous CBR tests on similar materials, a conservative CBR value of 10 for subgrade material compacted to 95 percent of maximum density was selected for design purposes.

Based on Technical Manual 5-822-2, p. 15, a 25-year period should be used for flexible pavement design of the access roads. Estimated annual visitation for the year 1975 is 150,000. From Figure EL-1 of DM-13, Draft Master Plan, estimated annual visitation for the year 2000 is 165,000. The Average Daily Traffic (ADT) for an average weekend day during the peak visitation month is estimated to be 700 vehicles.

Based on design criteria outlined in TM 5-822-2 and TM 5-822-5, the above ADT and mountainous terrain, a Class D, two-lane road should be used for design. From Table III of TM 5-822-5, a Design Index of 3 is indicated for Class "D" road and Category II.

Using the selected CBR value of 10, Design Index of 3 and Figure 3 of TM 5-822-5, a flexible pavement thickness of 10 inches is required.

Criteria for reduced subgrade strength due to frost penetration is considered applicable to the road design at these sites. Average annual depth of frost penetration at Trinidad is 20 inches. The subgrade was classified in frost group F2 for frost design purposes. Using the Reduced Subgrade Strength Method outlined in TM 5-818-2 a minimum pavement thickness of 14 inches is required. This design thickness will not provide complete protection from any frost action, but does take account of reduced CBR values during periods of thawing and thus will provide protection against a shear failure. Based on the criteria for flexible pavements listed in Table II of Technical Manual 5-822-5 the following pavement components should be used for a design Index of 3 and CBR of 80 for base course:

Compacted Subgrade (inches)	Subbase Course (inches)	Stabilized Aggregate Base Course (inches)	Surface Treatment
6	6	8	1-1/2" Hot Mix

8-06. Parking. Final location of parking areas will be field-sited and clearing of existing vegetation carefully controlled. Minimum parking space for automobiles will be 10 feet by 20 feet. Car-trailer spaces will be 10 feet by 40 feet for parallel and angle parking and 10 feet by 55 feet for back-in spur-type parking. Parallel parking for multiple use by buses and large camping-type vehicles will be provided at select locations. The parking spaces at the boat launching ramp are designed for integral boat-trailer use, with a limited number for single vehicle parking.

With the exception of the parking spaces in the Piedmont Group Camping Area, which will be surfaced with 6 inches of gravel, all other parking spaces will be surfaced with 2 inches of hot mix.

8-07. Launching Ramp. Design of the boat launching ramp is based on SWD Standard Design. The ramp will comprise three 14-foot wide lanes, constructed of concrete. Lower limit of the ramp will be at elevation 6139, four feet below the initial permanent pool. Upper limit of the ramp will be set at elevation 6203. The access road, constructed of bituminous pavement, will be widened to 42 feet to serve as a high-water ramp. It will extend to elevation 6226, about 2 feet below the irrigation pool. Plan and profile and details of the ramps are shown on Plates 6 and 10.

A courtesy dock such as the type manufactured by the United McGill Corporation will be provided at the boat ramps. No detail is shown.

8-08. Picnic Units. Individual picnic units will consist of a picnic table and pad, ground-level cooking grill, and shelter. A gravel wearing surface will be provided for each two units. A trash receptacle will be provided for each two units. Group picnic units include a group shelter, 8 tables, and a built-in cooking type fireplace. Plan elevations and details of the picnic units are shown on Plates 11 and 12.

8-09. Camping Units. Each camp unit will consist of a parking area to accommodate a car-trailer combination, picnic table and pad, and a ground-level cooking grill. One waste water drain and trash receptacle will be provided for each two sites. One half of the camp units will be provided with a tent pad. Each camp site will be field-sited to fit with the terrain and tree cover. Plate 15 and 16 show typical arrangements of the camping components.

8-10. Shelters. Shelters will be constructed of concrete and natural stone materials. Single shelters will have 2-way concrete slabs supported on short bearing walls having continuous footings. The group shelter is of precast, prestressed double tee roof units on cast-in-place concrete beams supported by columns and spot footings. Plan, elevations, and details of the shelters are shown on Plates 11 and 12.

8-11. Washhouse/Comfort Stations. Basic construction of the washhouse and water-borne stations is the same as group shelters, except that bearing walls and thickened slab footings will be used. Plan elevations and details of the combination washhouse and comfort stations are presented on Plates 13 and 14. Vault toilets will be as shown on Plate 16. Details will provide for sealing of toilet vaults in the event of flooding.

8-12. Overlooks. Two overlooks will be provided, one at the Trinidad Recreation Area and one at the Carpios Ridge Recreation Area. At the Trinidad Recreation Area, the existing temporary observation area will be salvaged and upgraded to provide a permanent overlook facility. Improvements will include paving the parking area and provision of a native stone wall with podium-type information sign. Plan and detail of the overlook area are shown on Plate 6. The Carpios Ridge overlook will include about 800 square feet of paved area surrounded by a native stone wall, a podium-type information sign, and paved walkway at the parking area at the circulation road. Plan and details of the overlook are shown on Plate 15.

8-13. Playground Facilities. Playground equipment will be provided at the Carpios Ridge Camping and Picnic Areas. Equipment will be confined to simple low-hazard units. The basic unit at each location will include two double swings and two slides, with half of the equipment specifically for small children.

8-14. Signs and Interpretive Guidance. Directional, instructional, and entrance signs utilized in the public use areas will be as those shown and described in the Colorado Division of Parks and Outdoor Recreation's Park Sign Manual. The Division will operate and maintain the recreation areas, and utilization of their sign designs will aid the Division in maintaining a uniform sign system and in its maintenance work.

8-15. Site Improvement, Grading, Landscaping. In order to retain the natural character of the sites, only minimum grading and clearing will be done in preparation for construction of the facilities. Clearing limits for roads will be confined within the top of back slopes and toe of the fill area. Grading will be required for the boat launching ramp and associated parking area. The concrete ramp will be located mostly on fill due to the rock foundation.

Landscaping will be employed on areas disturbed by construction. Landscaping measures will consist of restoring a grass cover and strategically locating transplanted native pinon and/or juniper trees.

8-16. Electrical Distribution. Electric power will be purchased from the San Isabel Electric Service, Inc. at primary voltage 2,400 volts, one-phase. The primary metering point for the Carpios Ridge Recreation Area will be at a pole located about 1,100 feet northeast of the intersection of the recreation access road and relocated State Highway No. 12. From the metering point, the Government will install an overhead primary line to the camping area. From this point, an underground primary line with pad mounted transformers will serve the washhouse/comfort station in the picnic area. Security lighting will be provided at all three facilities.

8-17. Water Supply System. Water for the recreation areas, as well as for the operations building, will be supplied from the city of Trinidad's water system. The city's water supply is filtered and chlorinated. Therefore, no further treatment will be required. The water system for the operations building and the Trinidad-Carpios Recreation Areas will be connected at the location shown on Plate 18. The water system for Piedmont Group Camp Area will be connected at the location shown on Plate 17. By prior agreement, the city has provided stub outs at these two locations.

Water for the Piedmont Group Camp Area will be supplied directly at the available pressure. Water for the remaining recreation areas and the operations building will be pumped to an

underground storage tank and then supplied by gravity to the points of usage. Layout of the supply system is shown on Plate 17.

The underground storage tank will be constructed of reinforced concrete and have a capacity of 24,500 gallons, the amount required for a 24-hour period of usage. Maximum water level in the tank will be controlled by a float valve and pressure switch to shut off the pump. The tank will be filled by activating the pump with a time clock. The pump, to be housed in a prefabricated metal building, is rated at 50 gpm to fill the storage tank in about 8 hours. Details of the tank, pump, and pump house are shown on Plate 17.

The distribution pipe is sized for the maximum demand based on fixture unit values in accordance with EM 1110-345-165. Air relief, vacuum relief and blow off valves will be provided. Pipe sizes and pertinent hydraulic data for the system are shown on Plate 18. Lines are sized for flow from storage and are of sufficient size for flow during the pumping cycle.

8-18. Waste Disposal. Waste disposal for the water borne facilities will consist of mechanically aerated oxidation basins and an evaporation pond for liquid effluent, individual aerobic type sewage treatment units, and attendant collector and effluent discharge lines. Non-water borne facilities consist of vault toilets and a trailer-camper dump station. Trash receptacles will be furnished for solid waste disposal. Details of the dump station, vault toilet, and trash receptacle are shown on Plates 9 and 16. Sewage from the comfort will be pretreated by use of model LF-300 low-flush water closets and model L-1000 annelgester as manufactured by Microphor, Inc. Effluent from the annelgester will be discharged into the sewer line serving the remaining fixtures.

The evaporation pond is sized to evaporate an annual volume of 309,000 cubic feet. Bottom area of the pond will be 49,400 S.F. with a water depth of 5 feet and 4 horizontal to 1 vertical side slopes. Two foot of freeboard will be provided. The pond will be lined with 20 mil P.V.C. placed on 6-inches of select granular fill. The lines will be overlaid with granular fill with an additional 6 inches of soil cement on the side slopes. Location of the evaporation pond is shown on Plate 5.

Two aeration basins will be provided. The basins will be arranged so they can be operated in parallel or in series or independent of each other. The volume of each basin will allow for a detention time of 3½ days. Each basin will be concrete lined with a 10 x 10 foot bottom, one horizontal to one vertical side slopes and a depth of 13 feet including 3 feet of free-board. Aeration will be accomplished by electric driven mechanical aerators.

All sewage and waste disposal facilities will be constructed to meet criteria of State and Federal pollution control agencies.

8-19. Small Boat Navigation Aids. Waters of the reservoir will be marked following the standards of the Uniform "State Waterways Marking System" and the U.S. Coast Guard System. Marking will include buoys to mark shallow waters and post speed limits. Buoys to mark the intake structure will be provided.

SECTION IX - MANAGEMENT CONCEPTS

9-01. General. The intent of this section is to provide concepts with which project resources can be properly developed and managed. Its prime objective is to form a basis from which a detailed plan can be formulated and implemented.

9-02. Project Resource Management. The Trinidad Lake Project is to be operated in its authorized capacity for flood control and storage of water for irrigation purposes. As a feature that is compatible with project function and which will greatly add to the benefits to be derived from the project, water storage for recreational purposes and attendant recreational facility development is to be incorporated into project operation. A multipurpose use concept will be employed over the life of the project, whereby project resources can be utilized or adapted to more fully benefit the total community. A compatible and balanced program must be paramount in project development and management.

Administration of the project shall be by the Albuquerque District, Corps of Engineers. All of the project area, with the exception of the embankment and areas required for operation and safety, will be available for some form of public utilization. The emphasis of recreational development is to be on the north side of the reservoir. This area is much more favorable for recreational development, the south side being severely limited by land availability, the location of the relocated Colorado and Wyoming Railroad tracks between the project boundary, and the lake shore, the influence of lake fluctuations, general lack of tree cover, and aesthetic considerations. Project lands below the embankment can be favorably utilized for limited recreation development, as could land located on the south shore just upstream from the embankment.

The Colorado Division of Parks and Outdoor Recreation will assume operation and maintenance of the public use areas and facilities and will administer the recreational program. Management objectives will serve the visiting public while simultaneously preserving or enhancing natural resources. Visitor use should be controlled to the extent necessary to retain a pleasant, interesting, and rewarding experience for all. Management of the area as a natural ecologic unit will not be employed, but, the area will be managed as a compatible ecological unit that will best serve the biotic community.

The Colorado Division of Wildlife in cooperation with the Corps of Engineers will develop and manage the lake fishery and wildlife habitat and administer public utilization of these resources.

9.03. Forest or Range Management. A majority of project lands support an attractive vegetative mantle of pinon-juniper woodland interspersed with grassed, open areas. The woodland bears little commercial value but is valuable for wildlife habitat, conservation of soils, and aesthetic enhancement. The pinon pine (predominant tree in project area), at intervals of several years, produces nuts highly sought after by both wildlife and humans. Its wood is rich in resin and is excellent firewood because it burns well with a pleasant aromatic odor.

Management principles should strive to preserve this woodland for the purposes mentioned above. Damage to trees from stripping for use as firewood and damage to the grass cover from foot traffic will probably be the most abusive effects, and facility design and management procedure will attempt to preclude or lessen these impacts.

The removal of vegetation, living or dead, will be permitted only with the soundest justification. Public abuse will be controlled by the citation program. Both State and Corps rules and regulations will be applicable on lands leased to the State

A landscaping plan will be developed for areas altered by construction activities. This will involve the replanting and planting of trees, shrubs, or grasses native to the area. Stockpiling of trees removed by construction activities and replanting a short time later at needed locations could be an effective money-saving method.

9-04. Fire Protection. The proximity of the project to an urban area with fire protection will contribute greatly to the protection of the area from fire. At the earliest opportunity, the Trinidad Fire Department will be contacted and a contingency plan developed to insure an effective and efficient plan of action.

Potential fire hazards should be identified on project lands and plans developed to eliminate or cope with such problems. All project personnel will be instructed in fire fighting techniques, and all areas will have emergency fire fighting equipment. Fire drills will be part of the fire prevention program.

All weed burning or other types of fires will be monitored by a crew with proper fire fighting equipment.

All equipment and systems will be inspected on a frequent and regular basis.

9-05. Fish and Wildlife Management.

a. Aquatic. The establishment of a permanent pool will

greatly expand the fishing potential at the project. As stated, the Colorado Division of Wildlife will manage the fishing program and will provide fish for the stocking program. Fish species consisting of rainbow trout, channel catfish, black bass, bluegill, walleye (pikeperch), white bass, and some forage fish will be stocked by the Division. The Division has suggested the provision of parking areas and walkin access points to the upper part of the reservoir to allow fishermen use during periods of high water. Those plans appear feasible and will be more intensively investigated when public use of the reservoir begins and preference for certain areas can be defined.

b. Terrestrial. As illustrated on Plate 3, part of the upstream portion of the lake has been allocated for wildlife management. Lands located in the upper part of the reservoir will experience periodic inundation, and, depending on the frequency of inundation, some natural revegetation of this area with pioneer species and later with more permanent and larger species could occur. This would provide good habitat for waterfowl, shorebirds and other forms of wildlife. A program that could enhance waterfowl habitat, depending on reservoir fluctuation, would be the establishment of natural (wild) waterfowl food tolerant to inundation or to periodic inundation and drying. Species such as softstem, hardstem, alkali, and three-square bulrush; giant and nodding smartweed; barnyard grass; and paspalum could be used in such an area. Softstem and hardstem bulrush will grow in water up to 6 feet once established, but do best in depths of 1 to 3 feet. These plants provide excellent cover and food and act as bank stabilizers. The remainder will grow in water depths of up to one foot but do best when planted on mud flats which are subject to periodic inundation and drying. These plants are excellent "edge plants", growing in the drier areas which may not support the roundstem bulrush. This program will be investigated when storage begins.

Of the areas designated for wildlife use, perhaps the Long Canyon area, although a relatively small area for wildlife habitat manipulation, has the best potential. The floor and lower sides of the canyon are grass covered, with the surrounding hills covered with pinon pine trees (some juniper and ponderosa pine). The Division of Wildlife is of the opinion that terraced, shallow, water detention structures could be readily constructed and could serve as a resting area for waterfowl and shorebirds. Areas contiguous to Long Canyon are rated as good wildlife habitat with both large and small game species. Cottontails, turkeys, quail, mourning doves, and waterfowl will be the prime species drawing hunters to this area.

The Division feels that the maintenance of much of the remaining area in as primitive a condition as possible would be the most beneficial for wildlife. It is the current feeling of the Division that other potentials for development may exist, but, at present, they are difficult to determine. When it can be evaluated how wildlife will react to the reservoir, fluctuations, and human use, more extensive plans can be formulated. It is quite possible that the formation of a body of water will draw wildlife to the area, thereby increasing populations in both kinds and numbers.

It should be kept in mind that management practices are to be conducted for the benefit of all wildlife utilizing the area as habitat. Nonconsumptive wildlife uses are to have an equal priority in planning and development.

9-06. Project Safety. The Resource Manager will identify common recurring hazards or unsafe conditions in each major phase or area of the project, and indicate precautionary actions to be taken to prevent, reduce, or control such hazards. This plan will be coordinated with the District Safety Office for review and recommendations prior to approval and will become an item of interest on safety surveys and inspections.

A continuing safety training program should be conducted to instruct personnel in safe practices and instill a safety conscious attitude in employees which will be habitually employed in daily work procedures.

SECTION X - SPECIAL PROBLEMS

10-01. Real Estate. No special problems or new requirements connected with real estate deficiency have been encountered.

10-02. Construction, General. Most of the project is situated on rock formations overlain by varying depths of shallow overburden. Some rock excavation will be necessary for facility installation, particularly the roads and the utility systems, but no special problems are apparent.

Project construction has produced some cuts and fill areas that are very prominent and detract from the aesthetic appeal of the area. This problem is further aggravated by differences in color of exposed soil or rock. Seeding of these areas with grass should assist in ameliorating this adverse effect. Severe soil and vegetal disturbances in public use areas will also have to be restored.

10-03. Natural Resource Preservation. No particular problems are foreseen here, although constant vigilance will be necessary to protect against abuse or overuse of environmental amenities, i.e., vegetation, soil, and scenery. Heavily trafficked areas will require special management and maintenance procedures, and off-road vehicle use of the area will be prohibited. Vegetal abuse will have to be carefully controlled. Developed trails and designated parking areas will assist materially in protecting against denuding and subsequent erosion. Modification of existing trails and addition of new trails may be necessary as traffic patterns develop.

10-04. Waste Disposal. Waste disposal requirements may be complicated by the relative shallowness of the soil cover. Location of some waste water drains may present some minor problems. It is anticipated that the Division of Parks and Outdoor Recreation will contract with the city of Trinidad for the pickup and disposal of solid waste generated from the recreation areas, this waste to be disposed of in existing sanitary landfills operated by the city. A contractural arrangement of this type would be much more favorable in most respects than the development of a landfill operation on project lands. The Corps will enter into similar agreements for disposal of solid waste generated from areas under its management.

10-05. Archeological and Historical Resources. Archeological investigations and salvage operations are being conducted on project lands to eliminate this feature as an area of concern. There are no historic sites within the project boundary.

10-06. Special Interest Requests for Outgranting of Project Lands. Trinidad State Junior College has, on two occasions, requested that the Corps consider leasing a small portion of Project lands for the development of a firing range to be used in their gunsmithing and law enforcement programs. While this is a worthwhile purpose and would enhance the College's educational program, it is suggested that, because of the paucity of suitable lands, the close supervision that would be required, and very possible conflict with the planned recreational development, that such an outgrant not be permitted.

10-07. Fencing. Heretofore, fencing of project boundaries has not been part of project development and, correspondingly, this item has not been budgeted for. It is estimated there will be approximately 87,000 feet of perimeter boundary fence required, costing an estimated $155,000. This cost should be included in the next budget.

SECTION XI - COST ESTIMATES

11-01. Summary of Estimated Costs. A summary of estimated costs for development of the recreation facilities is presented in Table VIII below.

TABLE VIII

SUMMARY OF ESTIMATED COSTS

Cost Acct	Item	Cost Estimate
14	Recreation Development	$1,420,000
30	Engineering and Design	140,000
31	Supervision and Administration	160,000
TOTAL		$1,720,000

11-02. Summary of Cost Estimates by Recreation Area. A summary of cost estimates for each individual recreation area in the following table:

TABLE IX

SUMMARY OF COST ESTIMATES BY RECREATION AREA

Area	Cost Estimate
Carpios Ridge	974,000
Trinidad	378,000
Piedmont	68,000
	$1,420,000

11-03. Detail Cost Estimate. Details of the estimated costs are presented in Table X below.

TABLE X

TRINIDAD LAKE, COLORADO
RECREATION FACILITIES
DETAILED COST ESTIMATE
(AUGUST 1975 PRICES)

COST ACCOUNT NO.	ITEM	UNIT	QUANTITY	UNIT COST	ITEM COST
14	Roads:				
	Access (22 ft. Paved)	L.F.	5,300	$25.00	$132,500
	Access (22 ft. Gravel)	L.F.	850	18.00	15,300
	Circulation (12 ft. Paved)	L.F.	4,850	19.00	92,150
	Circulation (12 ft. Gravel)	L.F.	450	12.00	5,400
	Drainage Structures	L.S.	--	--	11,000
					$256,350
	Parking Areas:				
	Paved	S.Y.	14,000	$11.00	$154,000
	Gravel	S.Y.	1,000	10.00	10,000
	Excavation (Rock)	C.Y.	300	4.00	1,200
					$165,200
	Trail	L.F.	2,000	$ 6.00	$ 12,000
	Boat Launching Ramp:				
	Concrete	C.Y.	650	$150.00	$ 97,500
	Riprap	C.Y.	1,000	10.00	10,000
	Pit Run Gravel	C.Y.	700	8.00	5,600
	Bedding Material	C.Y.	400	8.00	3,200
	Embankment (Fill)	C.Y.	20,000	1.50	30,000
	42-foot Wide Bituminous Ramp	L.F.	230	50.00	11,500
					$157,800
	Boat Dock	Ea.	1	$5,000.00	$ 5,000
	Shelter (Single)	Ea.	36	2,200.00	79,200
	Shelter (Group)	Ea.	3	11,000.00	33,000
	Tables With Pad	Ea.	86	500.00	43,000
	Tables Without Pad	Ea.	24	250.00	6,000
	Cooking Grill	Ea.	86	150.00	12,900
	Trash Receptacles	Ea.	52	50.00	2,600
	Waste Water Drain	Ea.	27	90.00	2,430
	Tent Pad	Ea.	35	400.00	14,000

COST ACCOUNT NO.	ITEM	UNIT	QUANTITY	UNIT COST	ITEM COST
14	(Continued)				
	Fire Circle	Ea.	2	$ 400.00	$ 800
	Playground Equipment	Ea.	2	2,000.00	4,000
	Overlooks	L.S.	--	--	30,000
	Fee Collection Station	Ea.	2	3,500.00	7,000
					$239,930
14	Water Supply System:				
	Water Line - 6"	L.F.	950	$ 10.00	$ 9,500
	" " - 4"	L.F.	700	6.50	4,550
	" " - 3½"	L.F.	1,050	4.80	5,040
	" " - 3"	L.F.	7,600	4.00	30,400
	" " - 1¼"	L.F.	2,000	2.20	4,400
	" " - 1"	L.F.	3,250	2.00	6,500
	Post Hydrant	Ea.	13	150.00	1,950
	Storage Tank	L.S.	--	--	28,000
	Pumping Station	L.S.	--	--	7,000
					$ 97,340
	Sanitary Facilities:				
	Wash House/Comfort Station	Ea.	1	$50,000.00	$ 50,000
	Comfort Station	Ea.	1	30,000.00	30,000
	Vault Toilet	Ea.	6	4,000.00	24,000
	Aeration Basins	L.S.	--	--	20,000
	Evaporation Pond	L.S.	--	--	80,000
	Chain Link Fence	L.F.	1,250	6.00	7,500
	Sewer Line - 8"	L.F.	1,500	11.00	16,500
	Manhole	Ea.	4	800.00	3,200
	Annelgester	Ea.	2	3,500.00	7,000
	Dump Station	L.S.	--	--	10,000
					$248,200
14	Electrical Distribution:				
	Overhead Primary	L.F.	3,000	$ 2.50	$ 7,500
	Underground Primary	L.F.	2,000	5.50	11,000
	Transformer	Ea.	20	50.00	1,000
	Security Lighting	L.S.	--	--	2,000
					$ 21,500
	Gas Supply	L.S.	--	--	$ 5,000
	Landscaping	L.S.	--	--	$ 25,000

COST ACCOUNT NO.	ITEM	UNIT	QUANTITY	UNIT COST	ITEM COST
14	(Continued)				
	Signs:				
	Traffic	L.S.	--	--	$ 1,000
	Information	L.S.	--	--	5,000
					$ 36,000
		Subtotal			$1,234,320
		Contingencies (15%)			185,680
		Total Contract Cost			1,420,000
30	E & D (10%)				140,000
					1,560,000
31	S & A (10.5%)				160,000
					$1,720,000

11-04. Comparison of Estimates. The latest approved PB-3, effective 1 October 1975, reflects a cost of $1,340,000 for account 14, Recreation Facilities. This amount was based on costs developed during preparation of the Draft Master Plan.

The present estimate for construction of the recreation facilities, account 14, is $1,420,000.00, an increase of $80,000. This increase is mainly due to design changes in the parking areas, boat launching ramp, the addition of a trail, and increased estimates for landscaping.

The present estimate for E & D and S & A is $140,000 and $160,000 respectively.

SECTION XII - CONCLUSIONS

11-01. This master plan presents a reasonable scheme for the development of the Trinidad Lake Project. Topographical features, size of pool, and appreciable fluctuations in water surface elevations are limiting factors in its use. The proposed plan is geared to these limitations, to the natural characteristic of the site, and to the demands of environmental protection.

This plan is intended to be flexible and is designed to permit changes to better meet the public need.

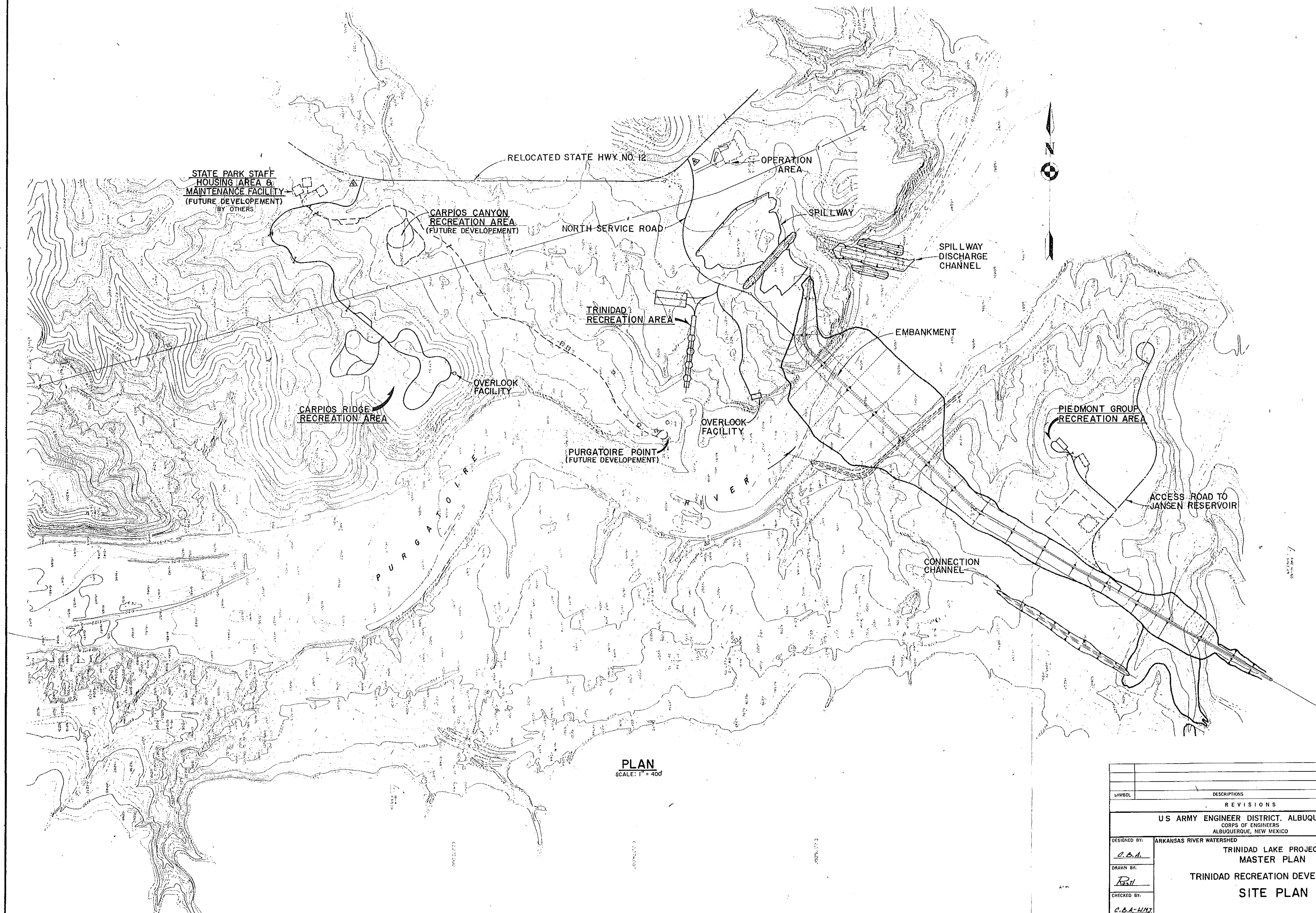
SECTION XIII - RECOMMENDATIONS

12-01. It is recommended that this master plan be approved as the basis for development and management of both present and future recreation facilities at Trinidad Lake.

Further, it is recommended that the site plans and facility plans as presented in this report be approved as a basis for development of detailed construction drawings and specifications.

AREA AND FACILITY DESIGN

Plates 4-18



SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: C.B.A.
DRAWN BY: Rosil
CHECKED BY: C.B.A.-W.M.J.

ARKANSAS RIVER WATERSHED — PURGATIORE RIVER, COLO.

TRINIDAD LAKE PROJECT
MASTER PLAN

TRINIDAD RECREATION DEVELOPMENT

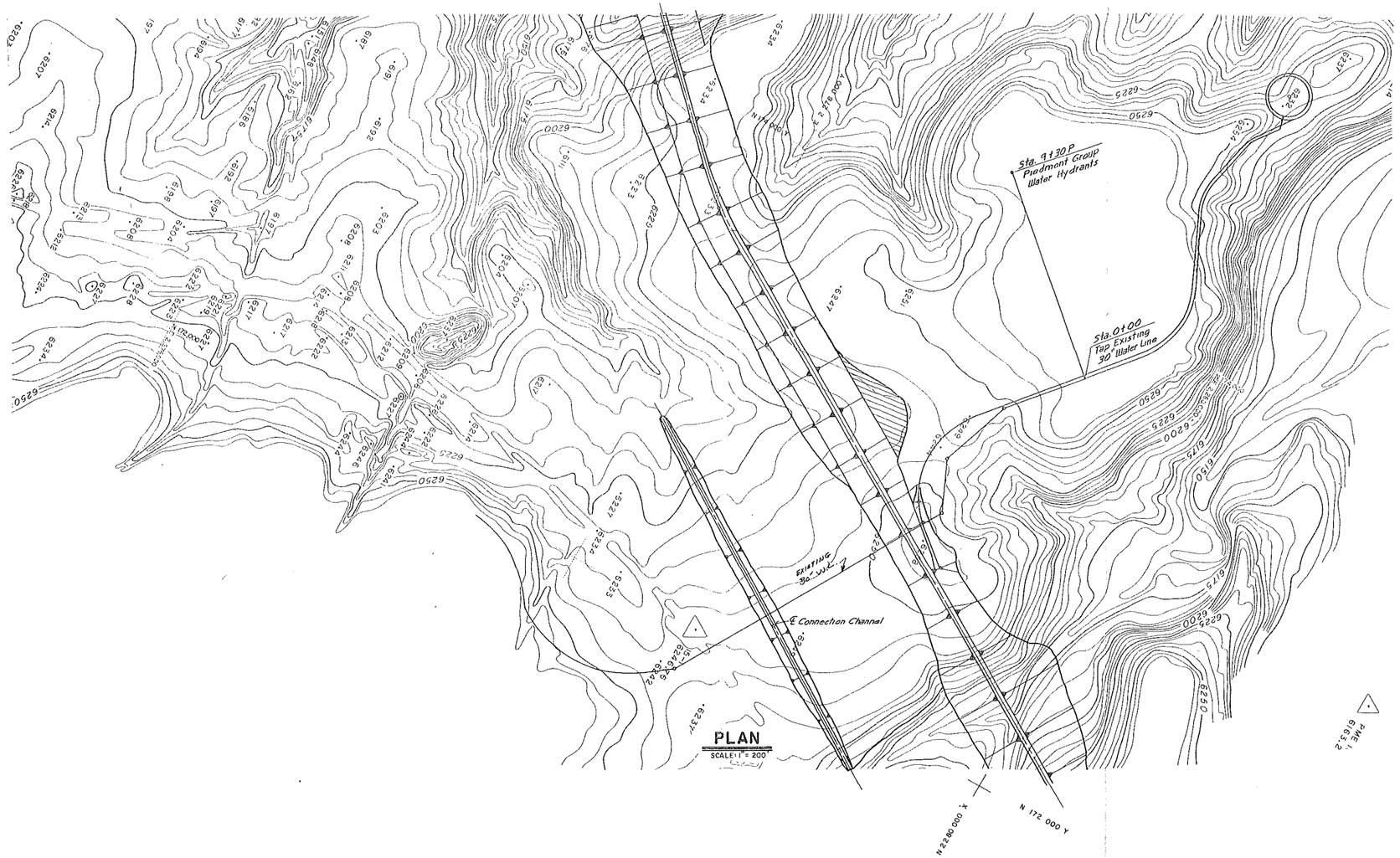
SITE PLAN

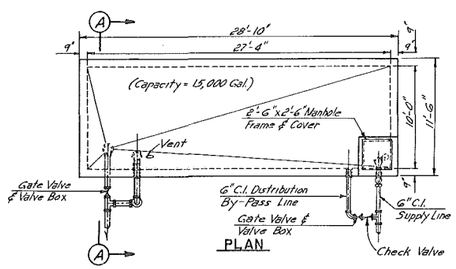
TO ACCOMPANY DESIGN MEMORANDUM NO. 13

DATE: AUG 1975

FILE NUMBER ARR - DM - J - 4

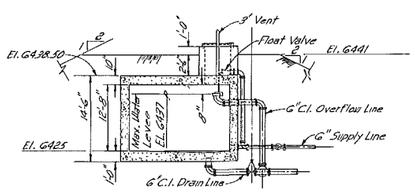
PLATE 4



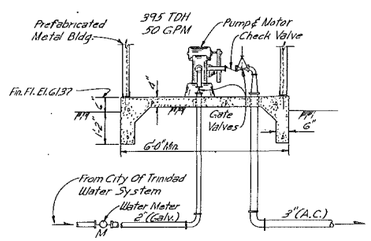


GROUND STORAGE TANK

NOT TO SCALE



SECTION A-A



PUMPING STATION SECTION

NOT TO SCALE

US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

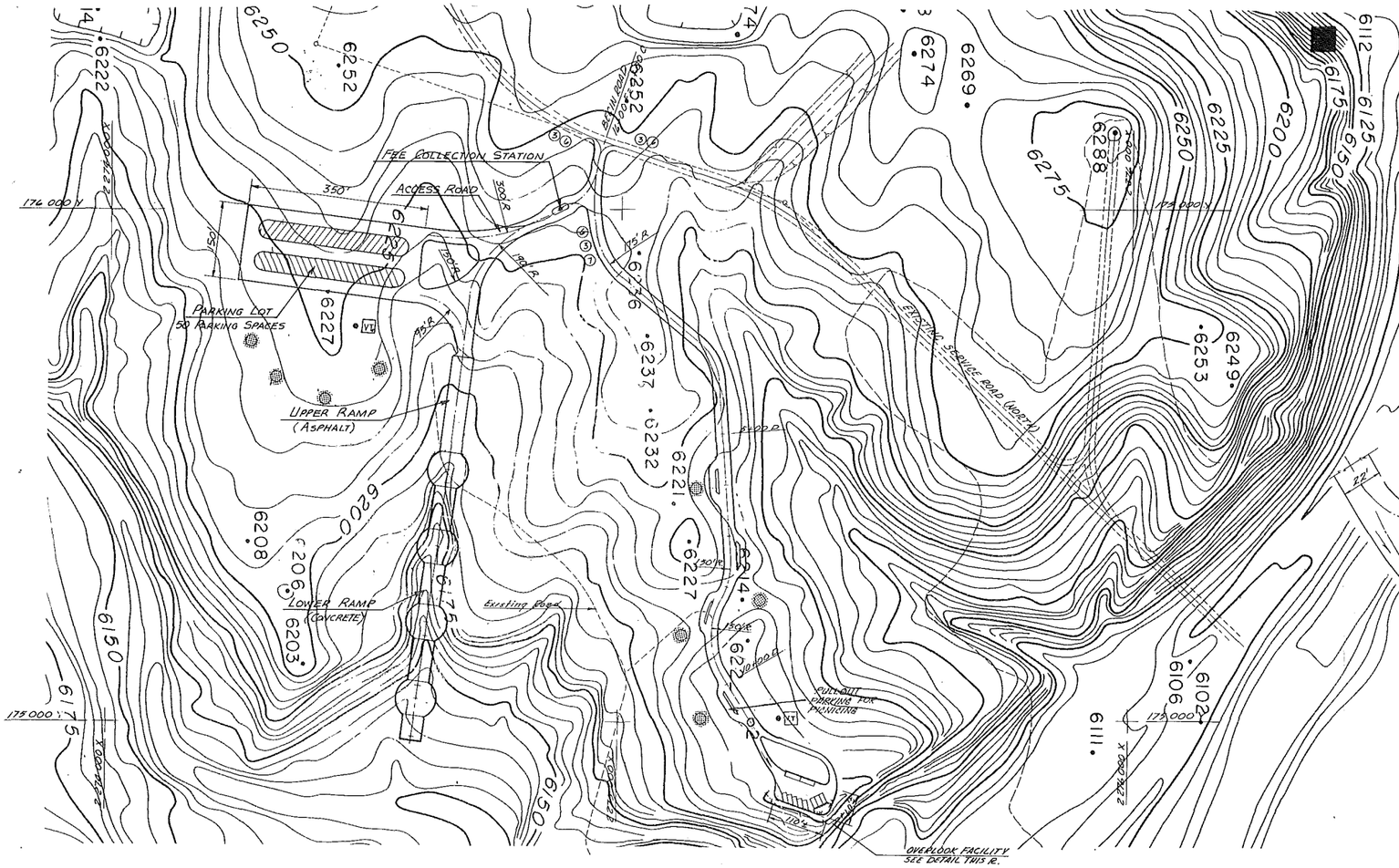
ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLORADO

TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS

WATER SUPPLY SYSTEM

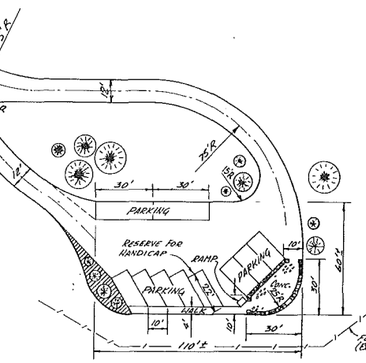
PLANS AND SECTIONS

DESIGNED BY: J. WINGET	
DRAWN BY: R. MONTOYA	
CHECKED BY: J. WINGET	
TO ACCOMPANY DESIGN MEMORANDUM NO. 13	FILE NUMBER ARR-DM-J-17
DATE: AUG 1975	PLATE 17



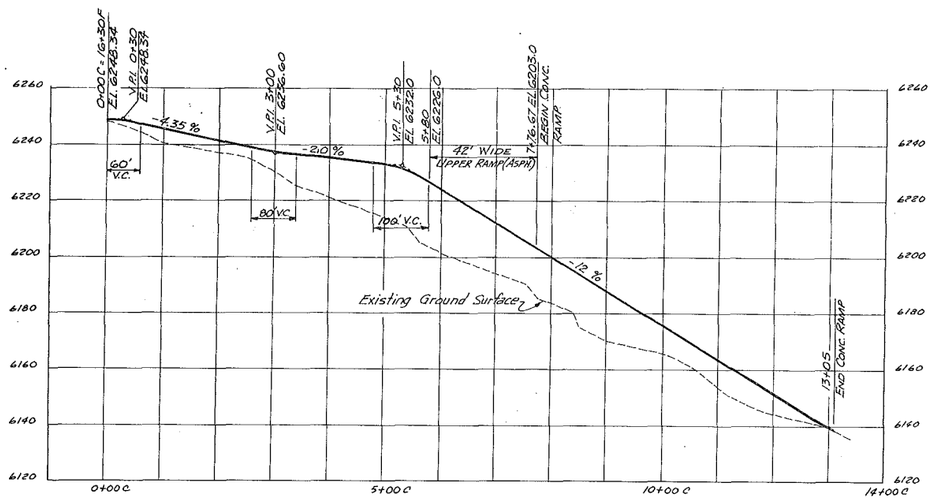
PLAN

SCALE: 1"=100'

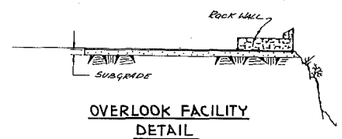


PLAN

NOTE: WALK TO BE RAISED 6" TO SERVE AS BUMPER.



PROFILE - ROAD & RAMPS



OVERLOOK FACILITY
DETAIL
NOT TO SCALE

GRAPHIC SCALES

1"=100' 0 50' 100' 200' 300'

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

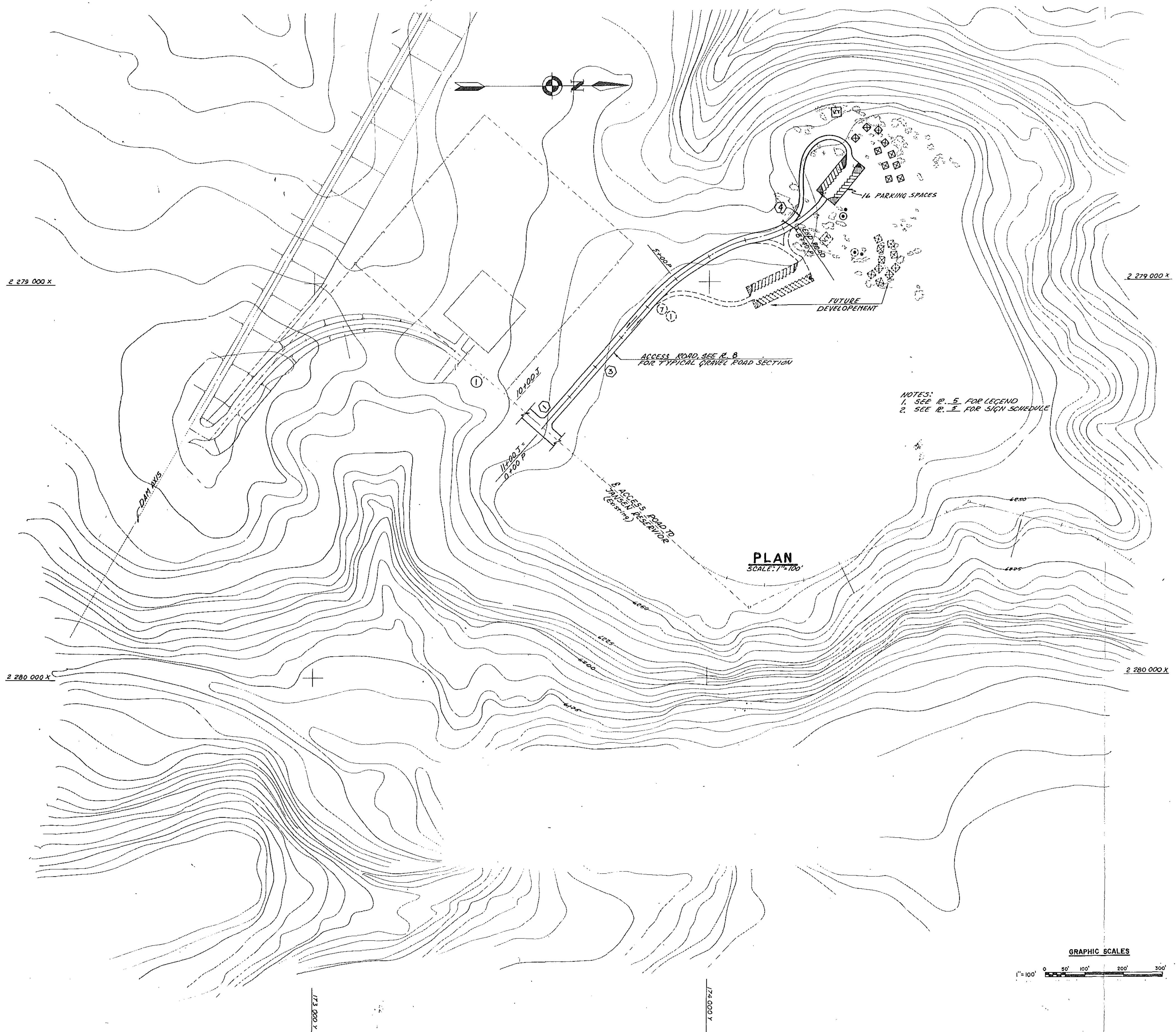
US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: C.B.A.	ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.
DRAWN BY: Pratt	TRINIDAD LAKE PROJECT
CHECKED BY: C.B.A.-H.M.T.	MASTER PLAN
	TRINIDAD RECREATION AREA
	PLAN & PROFILE

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG 1975

FILE NUMBER
ARR - DM - J - 6

PLATE
6



US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

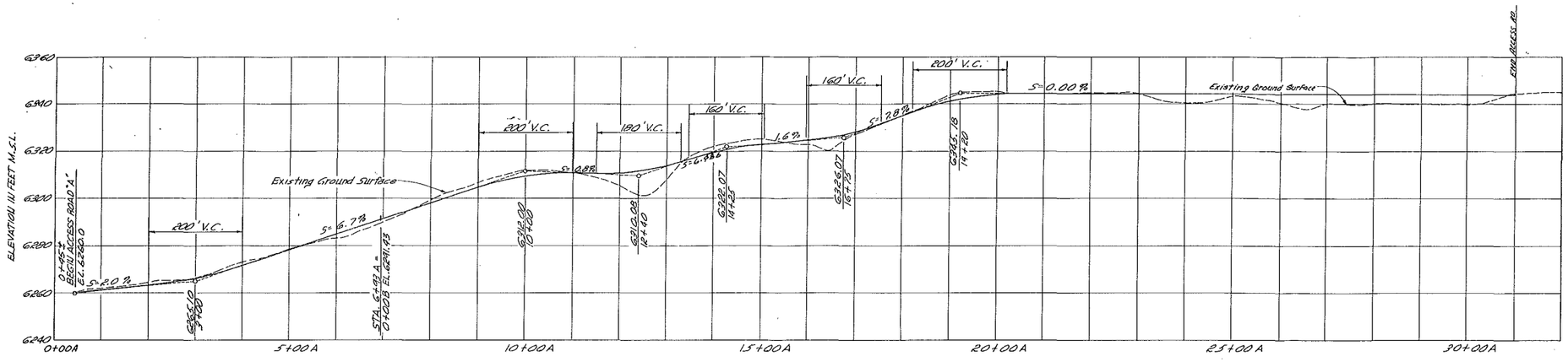
DESIGNED BY: C.B.A.	ARKANSAS RIVER WATERSHED — PURGATIORE RIVER, COLO
DRAWN BY: Rost	TRINIDAD LAKE PROJECT. MASTER PLAN
CHECKED BY: W.M.J.	PIEDMONT GROUP RECREATION AREA PLAN

TO ACCOMPANY DESIGN MEMORANDUM NO. 13

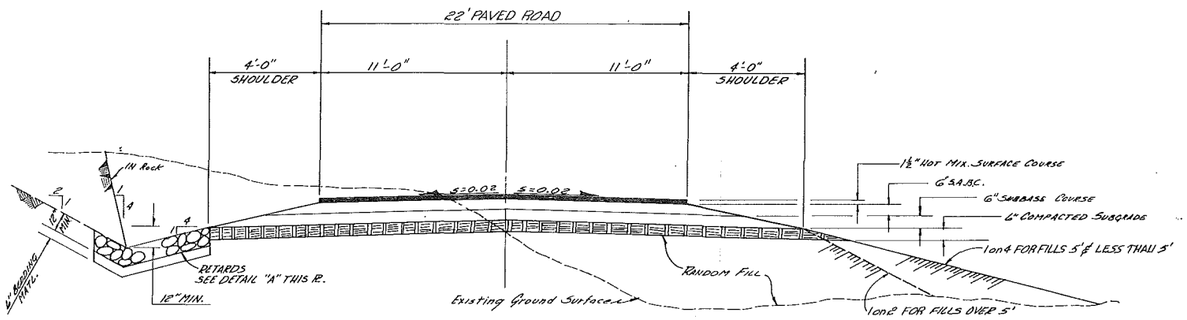
DATE: AUG. 1975

FILE NUMBER: ARR-DM-J-7

PLATE: 7



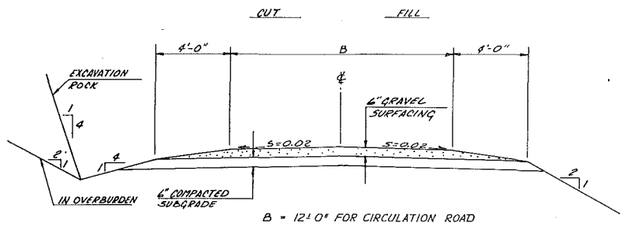
PROFILE
ACCESS ROAD "A"
SCALE: 1"= 100'



CUT FILL

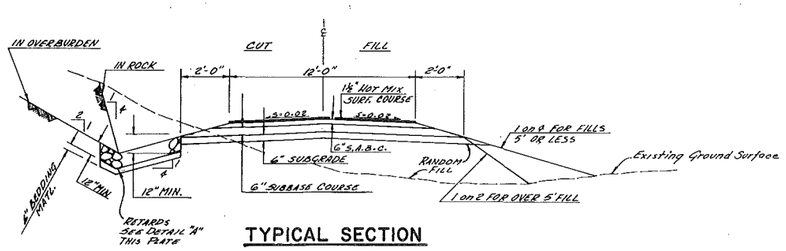
TYPICAL SECTION
PAVED ACCESS ROAD
NOT TO SCALE

Note: Cut and fill areas from edge of shoulder to be revegetated with grass.

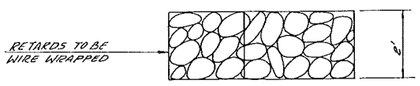


B = 12'-0" FOR CIRCULATION ROAD
B = 22'-0" FOR ACCESS ROAD

TYPICAL SECTION
GRAVEL ROAD
SCALE: 1"= 3'-0"

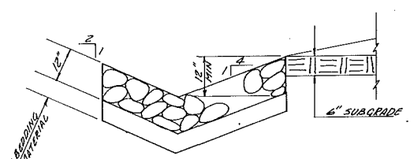


TYPICAL SECTION
CIRCULATION ROADS
NOT TO SCALE



C TO C

DITCH GRADE	SPACING FOR RETARDS
2 To 3%	50'
3 To 4%	30'
4 To 5%	25'
5 To 6%	20'
OVER 6%	16'



RETARDS DETAIL "A"
NOT TO SCALE

GRAPHIC SCALES

1"= 30' 0 10' 20' 30' 60' 90'

1"= 100' 0 50' 100' 200' 300'

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: D.T.L. & C.D.A.
DRAWN BY: R.A. & R.M.
CHECKED BY: C.D.A.-W.N.T.

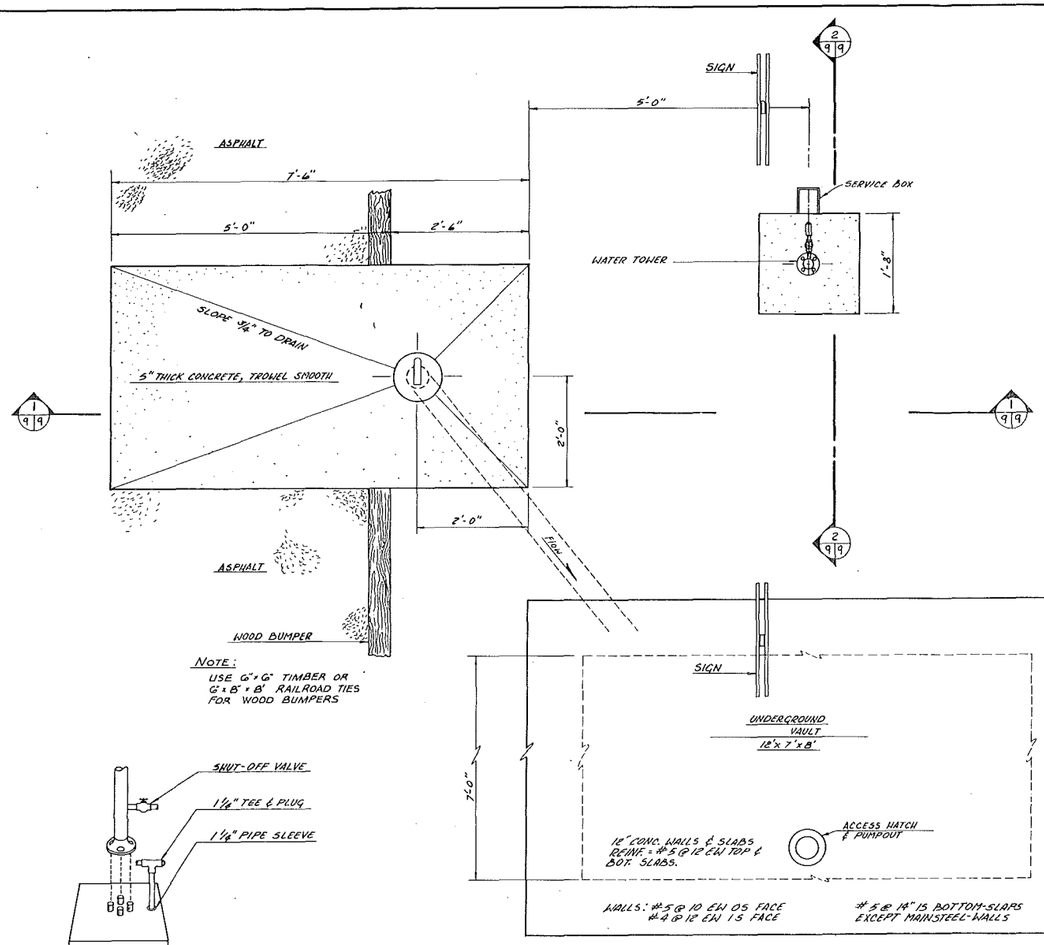
ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.
TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS
ACCESS & CIRCULATION ROAD
PROFILE, SECTIONS & DETAILS

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG 1975

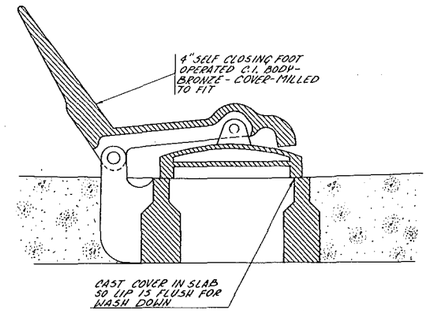
FILE NUMBER ARR - DM - J - 8

PLATE 8

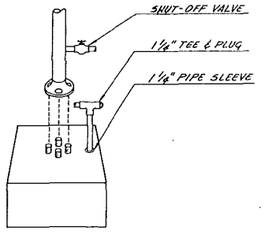
VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



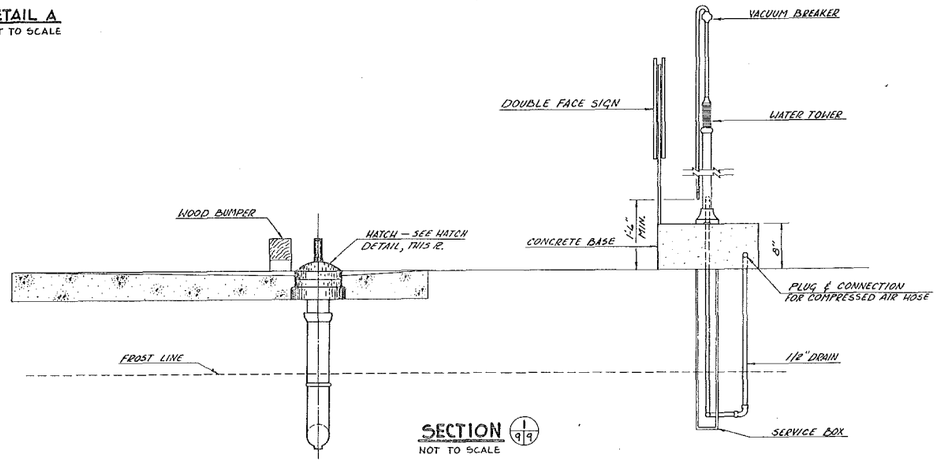
PLAN
NOT TO SCALE



HATCH DETAIL
NOT TO SCALE



DETAIL A
NOT TO SCALE



SECTION (1/9)
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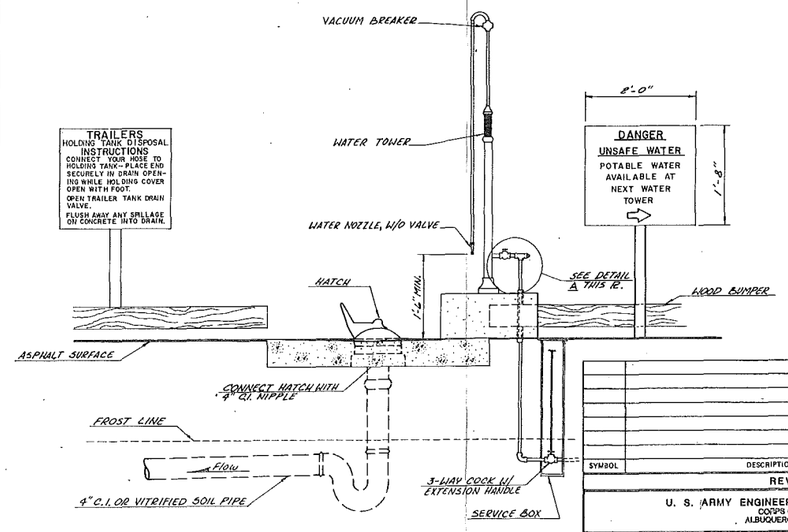


SECTION (2/9)
NOT TO SCALE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: C.B.A.
DRAWN BY: Ruth
CHECKED BY: C.B.A. W.N.J.

ARKANSAS RIVER WATERSHED PURGATOIRE RIVER, COLO.

TRINIDAD LAKE PROJECT
MASTER PLAN
CARPIOS RIDGE RECREATION AREA

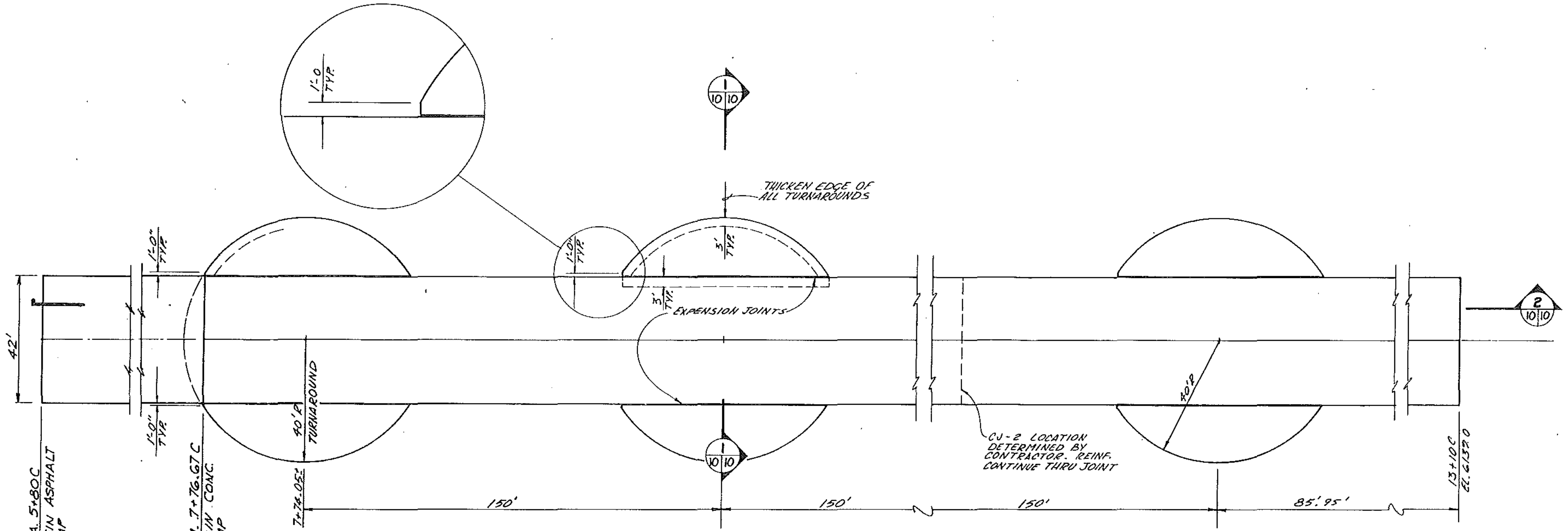
SANITARY DUMP STATION
PLAN, SECTIONS & DETAILS

TO ACCOMPANY DESIGN MEMORANDUM NO.13
DATE: AUG. 1975

FILE NUMBER ARR-DM-J-9

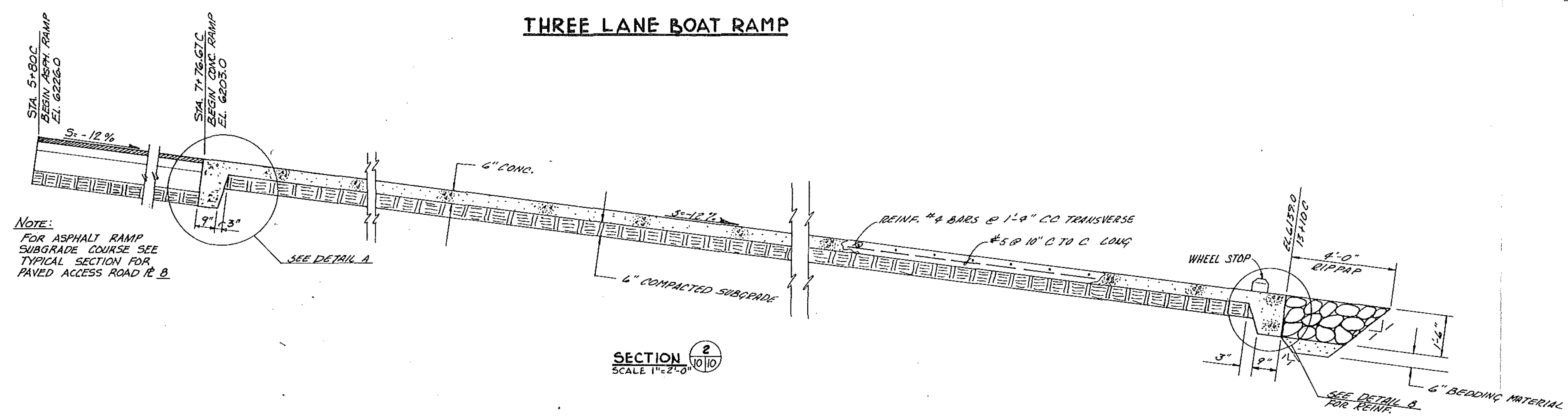
PLATE 9

VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS

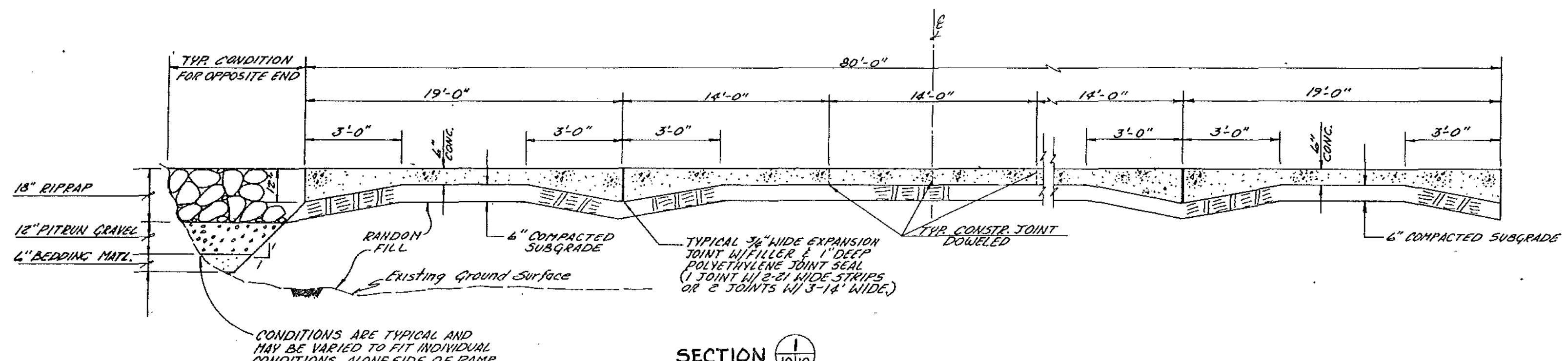


PLAN
SCALE: 1"=20'

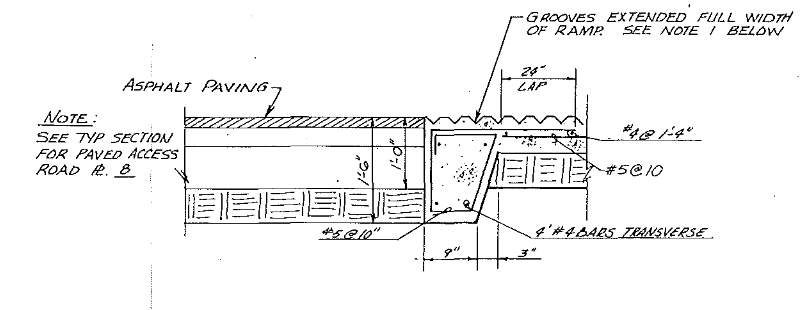
THREE LANE BOAT RAMP



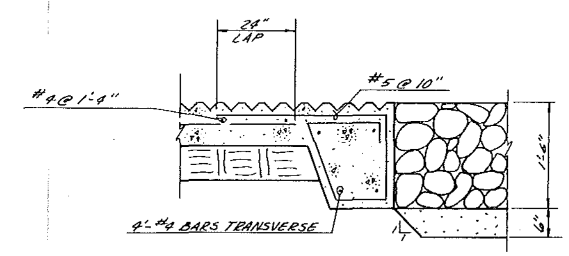
SECTION 2/10
SCALE 1"=2'-0"



SECTION 1/10
NOT TO SCALE



DETAIL A
NOT TO SCALE



DETAIL B
NOT TO SCALE

NOTES:
1. RAMP SURFACE TREATMENT: GROOVES TO BE FORMED AT A 10° ANGLE TO THE WIDTH WITH A MOLD OF SHEET STEEL, APPROXIMATLY 12 GROOVES WIDE AND 8'-10" LONG, AND FINALLY FINISHED WITH A LONG HANDLED FLOAT NOT LESS THAN 6 GROOVES WIDE, OR APPROVED EQUAL.

NOTE: ALL OPERATIONS PERFORMED IN ACCOMPLISHING THIS WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE CORPS OF ENGINEERS MANUAL "GENERAL SAFETY REQUIREMENTS" AND THE CONTRACT SPECIFICATIONS MANUAL INCLUDES CHANGE 1; DATED 1 MARCH 1972.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

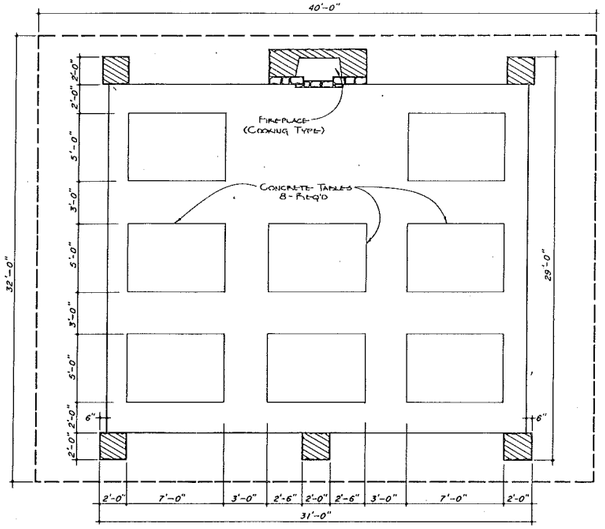
DESIGNED BY: O.B.A.
DRAWN BY: Roybal
CHECKED BY: O.B.A.-U.M.T.

ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.
TRINIDAD LAKE PROJECT
MASTER PLAN
TRINIDAD RECREATION AREA

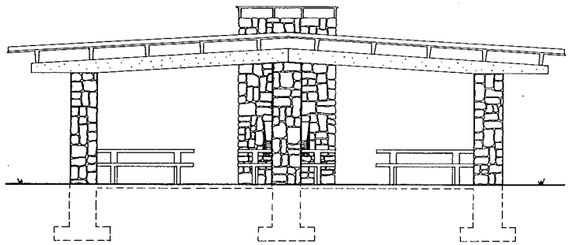
THREE LANE BOAT RAMP
PLAN, SECTIONS & DETAILS

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG. 1975
FILE NUMBER: ARR - DM - J - 10
PLATE: 10

VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



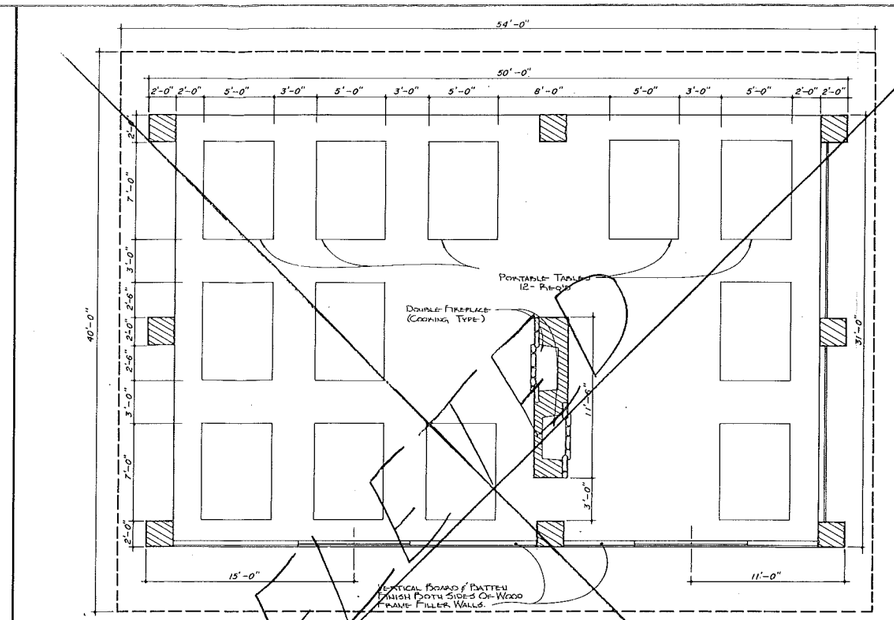
PLAN



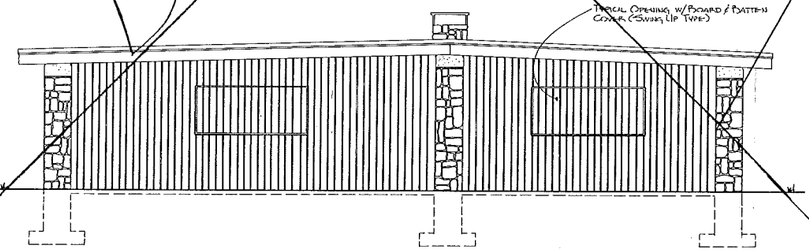
ELEVATION

EIGHT TABLE SHELTER

Scale: 1/4" = 1'-0"



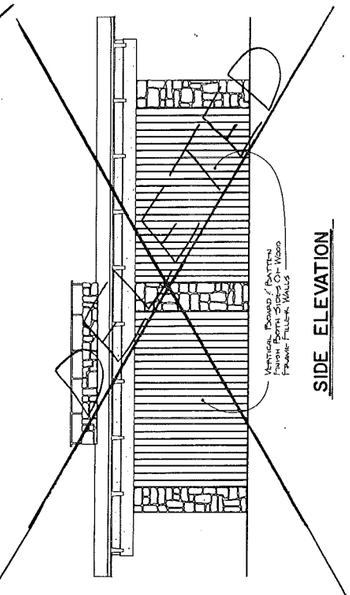
PLAN



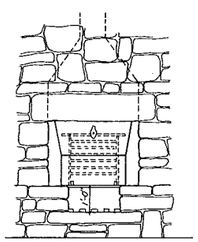
ELEVATION

TWELVE TABLE SHELTER

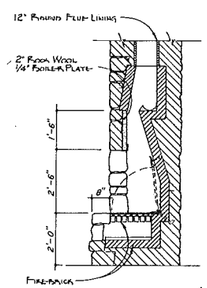
Scale: 1/4" = 1'-0"



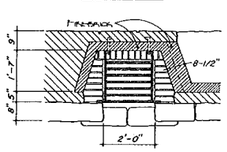
SIDE ELEVATION



ELEVATION



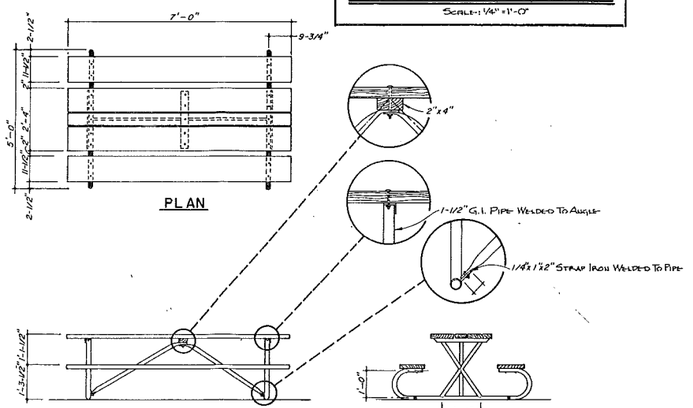
SECTION



PLAN

FIREPLACE (COOKING TYPE)

Scale: 1/2" = 1'-0"



PLAN

ELEVATION

END ELEVATION

PORTABLE PICNIC TABLE

Scale: 1/2" = 1'-0"

GRAPHIC SCALES

1/8" = 1'-0" 0 1' 2' 4' 6' 12'

1/2" = 1'-0" 0 1' 2' 3' 4' 6'

NOTE: ALL OPERATIONS PERFORMED IN ACCOMPLISHING THIS WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE CORPS OF ENGINEERS MANUAL "GENERAL SAFETY REQUIREMENTS" AND THE CONTRACT SPECIFICATIONS. MANUAL INCLUDES CHANGE 1; DATED 1 MARCH 1972.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

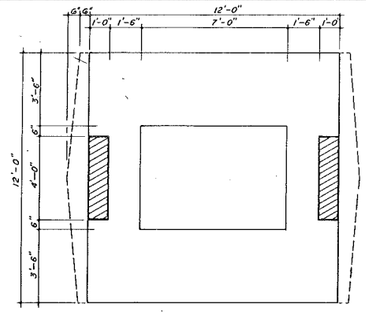
U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: G.G., J.Mc	ARKANSAS RIVER WATERSHED	PURGATOIRE RIVER, COLO.
DRAWN BY: B.J. Varela	TRINIDAD LAKE PROJECT MASTER PLAN CARPIOS RIDGE & PIEDMONT RECREATION AREAS	
CHECKED BY: J. Mc	GROUP PICNIC SHELTER PLAN, ELEVATION & DETAILS	

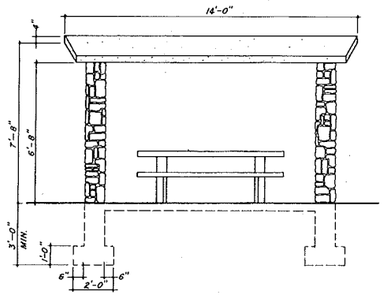
TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG. 1975

FILE NUMBER
ARR - DM - J - 11

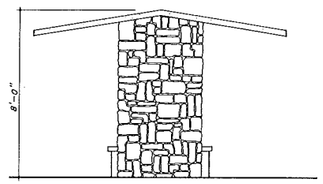
PLATE
11



PLAN



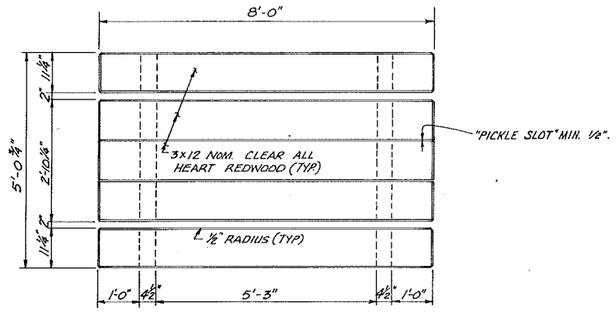
ELEVATION



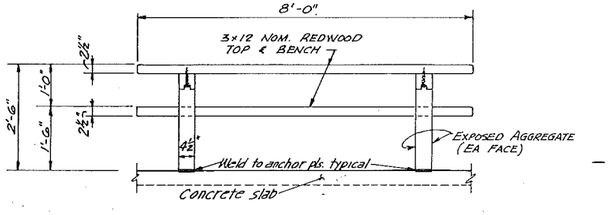
SIDE ELEVATION

SINGLE SHELTER

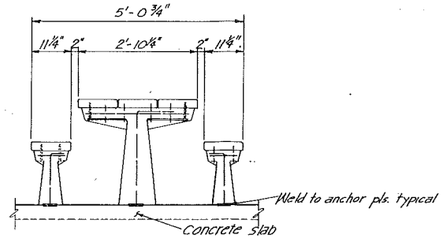
SCALE: 3/8" = 1'-0"



PLAN



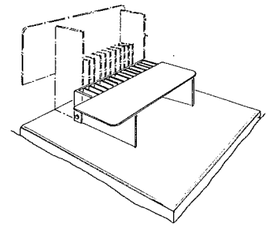
SIDE ELEVATION



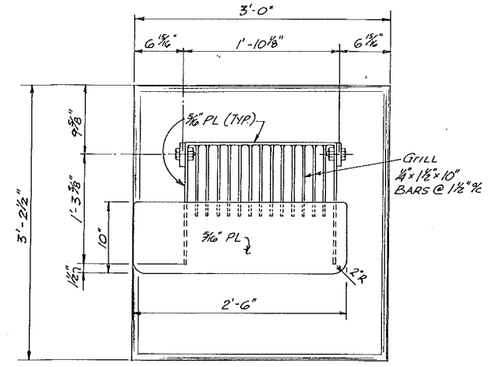
END ELEVATION

PICNIC TABLE

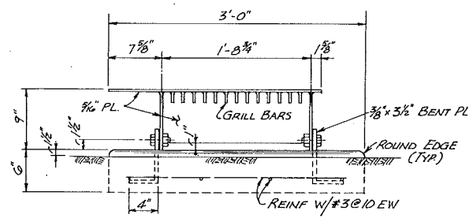
SCALE: ¾" = 1'-0"



PESPECTIVE



PLAN

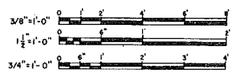


ELEVATION

FLIP TOP FIREPLACE

SCALE: 1½" = 1'-0"

GRAPHIC SCALES



NOTE: ALL OPERATIONS PERFORMED IN ACCOMPLISHING THIS WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE CORPS OF ENGINEERS MANUAL "GENERAL SAFETY REQUIREMENTS" AND THE CONTRACT SPECIFICATIONS. MANUAL INCLUDES CHANGE 1; DATED 1 MARCH 1972.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: [illegible]
DRAWN BY: B.J. Vorsila
CHECKED BY: J. Mc.

ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.

TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS

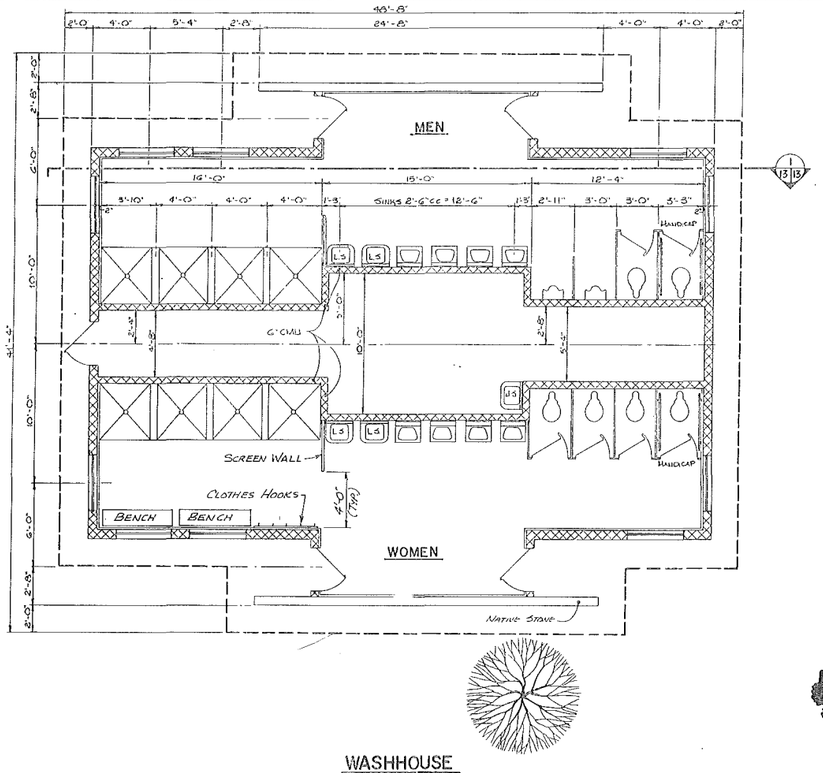
SINGLE PICNIC SHELTER, TABLE & GRILL PLANS & ELEVATIONS

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG. 1975

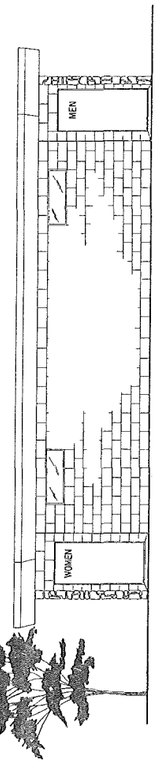
FILE NUMBER ARR-DM-J-12

PLATE 12

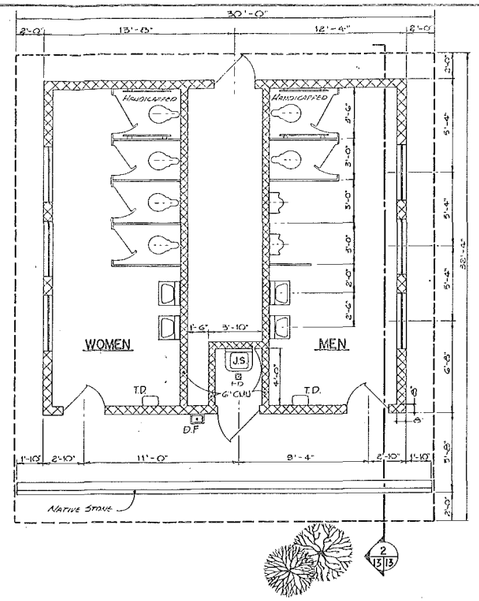
VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



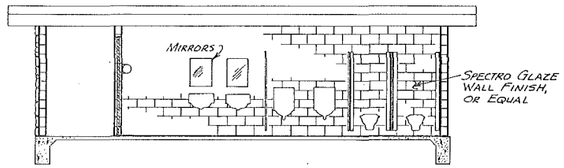
WASHHOUSE PLAN
SCALE: 1/4" = 1'-0"



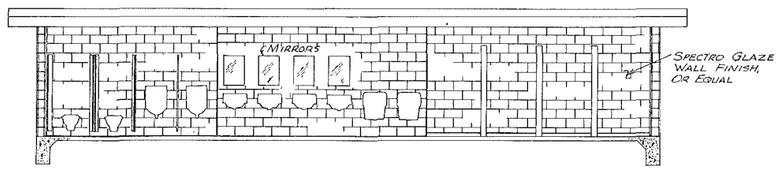
SIDE ELEVATION
SCALE: 1/4" = 1'-0"



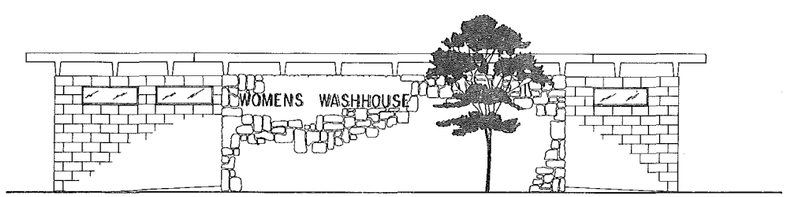
COMFORT STATION PLAN
SCALE: 1/4" = 1'-0"



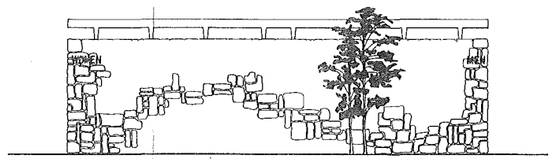
SECTION (2/13/13)
SCALE: 1/4" = 1'-0"



SECTION (1/13/13)
SCALE: 1/4" = 1'-0"



FRONT ELEVATION
SCALE: 1/4" = 1'-0"



FRONT ELEVATION
SCALE: 1/4" = 1'-0"

LEGEND

- JS — JANITOR SINK
- LS — LAUNDRY SINK
- T.D. — PAPER TOWEL DISPENSER
- D.F. — DRINKING FOUNTAIN

GRAPHIC SCALES
1/4" = 1'-0" 0 2' 4' 8' 12'

NOTE: ALL OPERATIONS PERFORMED IN ACCOMPLISHING THIS WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE CORPS OF ENGINEERS MANUAL "GENERAL SAFETY REQUIREMENTS" AND THE CONTRACT SPECIFICATIONS. MANUAL INCLUDES CHANGE 1; DATED 1 MARCH 1972.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: J. MC.
DRAWN BY: B.J. Varela
CHECKED BY: J. MC.

ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLORADO

TRINIDAD LAKE PROJECT
MASTER PLAN
CARPIOS RIDGE RECREATION AREA

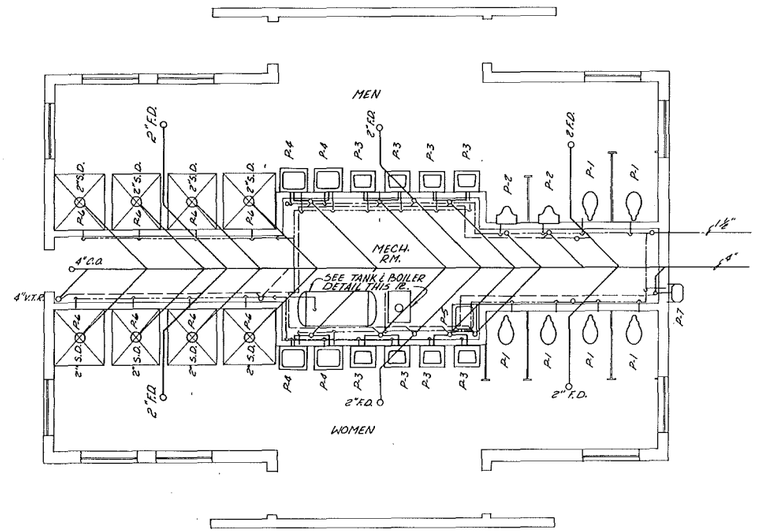
WASHHOUSE & COMFORT STATION PLANS, SECTIONS & DETAILS

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG 1975

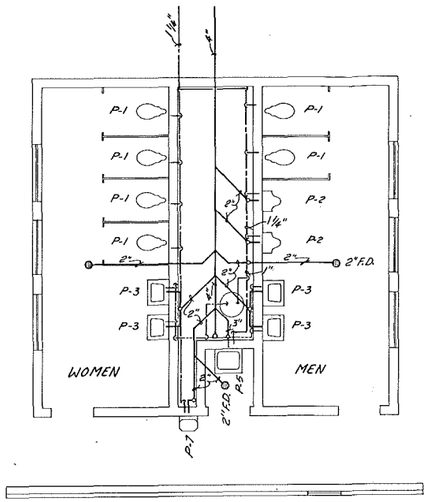
FILE NUMBER: ARR-DM-J-13

PLATE: 13

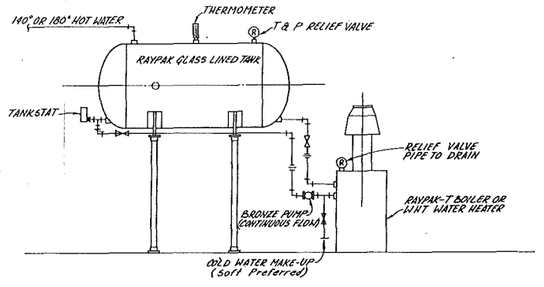
VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



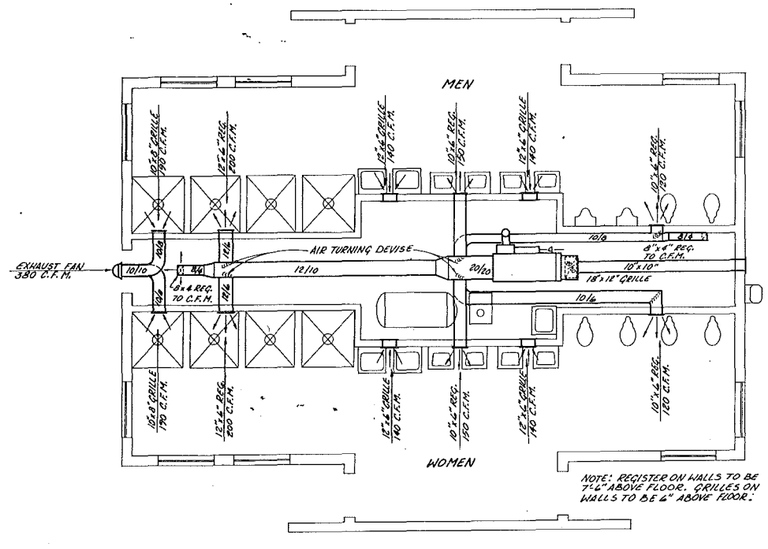
PLUMBING PLAN
SCALE: 1/8"=1'-0"



PLUMBING PLAN
SCALE: 1/4"=1'-0"

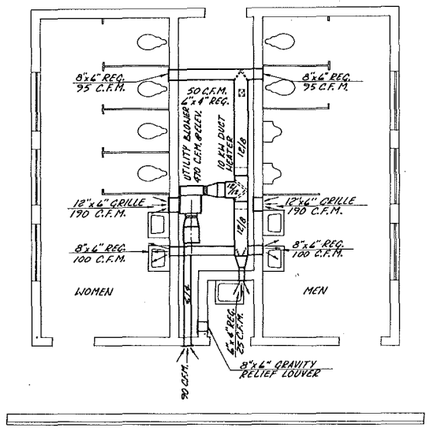


WATER TANK & BOILER PIPING DETAIL
NOT TO SCALE



HEATING PLAN
SCALE: 1/8"=1'-0"

WASHHOUSE HEATING & PLUMBING



HEATING PLAN
SCALE: 1/8"=1'-0"

COMFORT STATION HEATING & PLUMBING

NOTE: ALL OPERATIONS PERFORMED IN ACCOMPLISHING THIS WORK SHALL BE DONE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE CORPS OF ENGINEERS MANUAL "GENERAL SAFETY REQUIREMENTS" AND THE CONTRACT SPECIFICATIONS. MANUAL INCLUDES CHANGE 1; DATED 1 MARCH 1972.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

U. S. ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: R.B.
DRAWN BY: Rosil
CHECKED BY: W. M. J.

ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLORADO

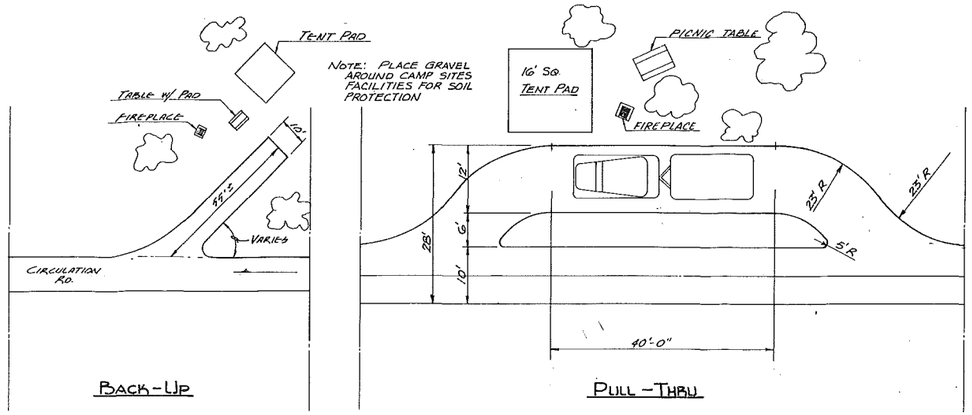
TRINIDAD LAKE, PROJECT
MASTER PLAN
CARPIOS RIDGE RECREATION AREA
WASHHOUSE & COMFORT STATION
PLUMBING & HEATING PLANS

TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG 1975

FILE NUMBER ARR-DM-J-14

PLATE 14

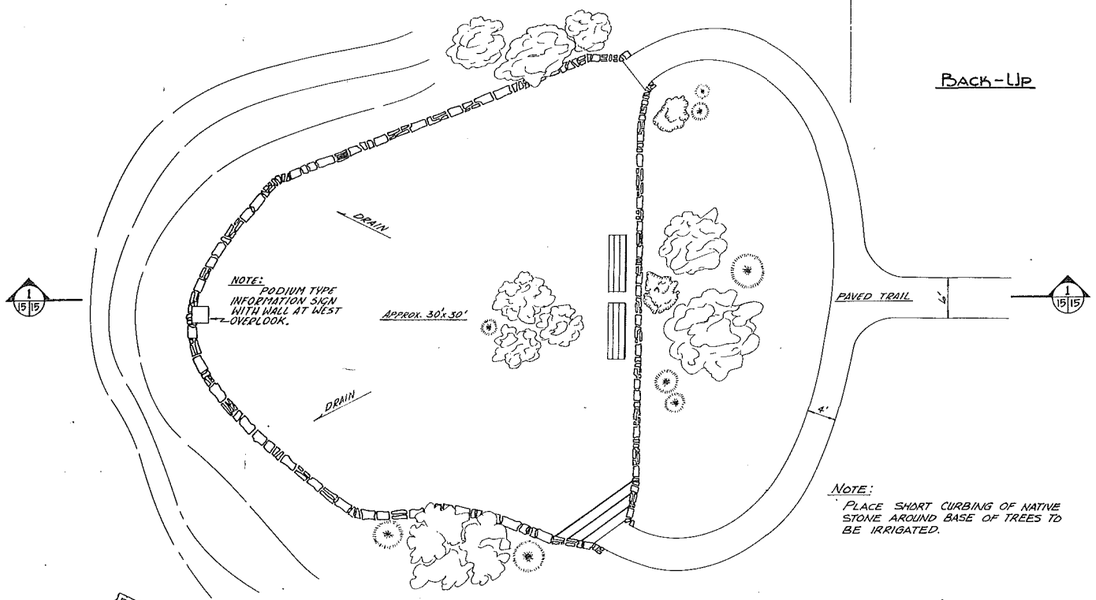
VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



BACK-UP

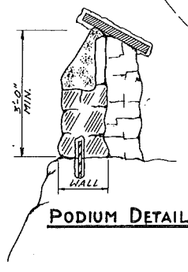
PULL-THRU

TYPICAL CAMP SITES
NOT TO SCALE

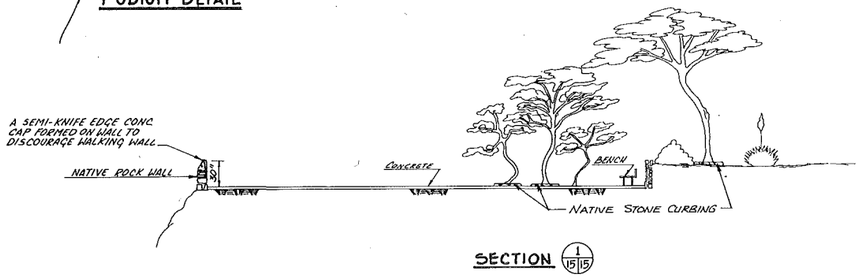


NOTE:
PLACE SHORT CURBING OF NATIVE STONE AROUND BASE OF TREES TO BE IRRIGATED.

PLAN
NOT TO SCALE

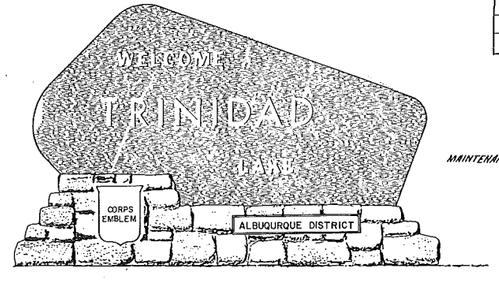


PODIUM DETAIL



SECTION 1/15/15

OVERLOOK FACILITY - CARPIOS RIDGE
NOT TO SCALE



ENTRANCE SIGN

MAINTENANCE AND OPERATION BY OTHERS

REMARKS:
USE SIGN NO. (A) AT CARPIOS RECREATION AND NO. (A) AT THE OPERATIONS AREA.

PROJECT SIGNS & MARKERS SCHEDULE

SIGN NO.	DISCRIPTION	ORDER NO.
(1)	CAMP GROUNDS	306
(2)	PICNIC GROUNDS	335
(3)	BOAT LAUNCHING	305
(4)	GROUP SHELTER	310
(5)	RECREATION AREA	340
(6)	OVERLOOK FACILITY	324
(7)	PARKING AREA	327
(8)	PICNICING ONLY	329
(9)	PLEASE HELP KEEP AREA CLEAN	601
(10)	ONE-WAY SIGNS	102 103

UNIFORM TRAFFIC CONTROL SIGN SCHEDULE

SIGN NO.	DISCRIPTION	ORDER NO.
(1)	STOP SIGN	R1-1
(2)	YIELD	R1-2
(3)	SPEED LIMIT	R2-1
(4)	KEEP RIGHT	R4-7a
(5)	WINDING ROAD	W1-5R
(6)	45° INTERSECTION	W2-3

GRAPHIC SCALES
1"= 10' 0 5' 10' 20' 30'

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

DESIGNED BY: C.B.A.
DRAWN BY: R.G.S.
CHECKED BY: C.B.A.-W.M.J.

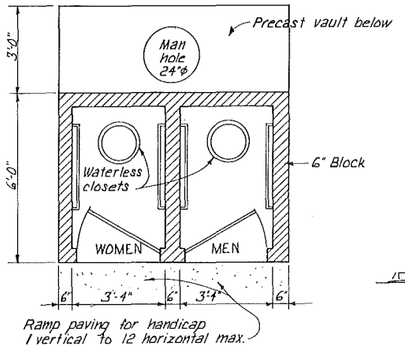
ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.

TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS
MISCELLANEOUS DETAILS

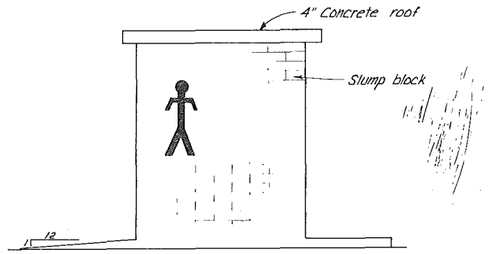
TO ACCOMPANY DESIGN MEMORANDUM NO. 13
DATE: AUG 1975

FILE NUMBER
ARR-DM-J-15

PLATE
15



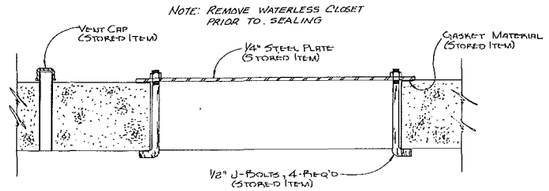
PLAN



SIDE ELEVATION

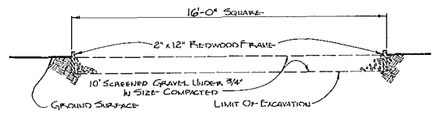
SEALABLE VAULT TOILET

SCALE: 3/4" = 1'-0"



SEAL DETAIL

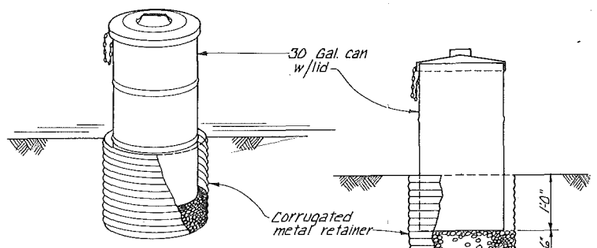
SCALE: 3" = 1'-0"



CROSS SECTION

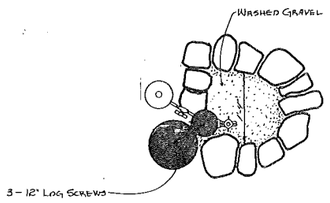
TENT PAD

SCALE: 3/8" = 1'-0"

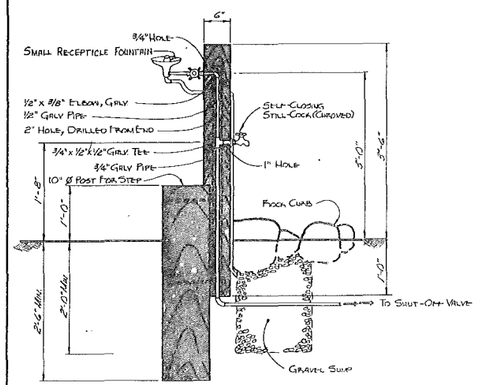


TRASH CAN & RETAINER

NOT TO SCALE



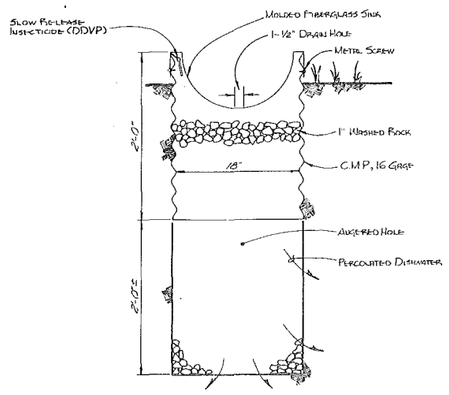
PLAN



ELEVATION

FOREST FOUNTAIN

SCALE: 1" = 1'-0"



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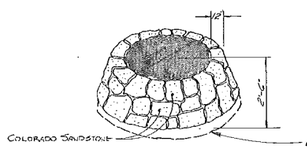
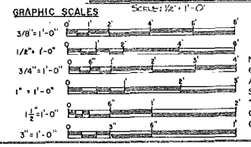


CIRCLE FIREPLACE

SCALE: 1/2" = 1'-0"

GRAPHIC SCALES



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ALBUQUERQUE, NEW MEXICO

ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLO.

TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS

MISCELLANEOUS DETAILS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
J.M.C., B.J.V.	B.J. Varela, G.D.	J. H.

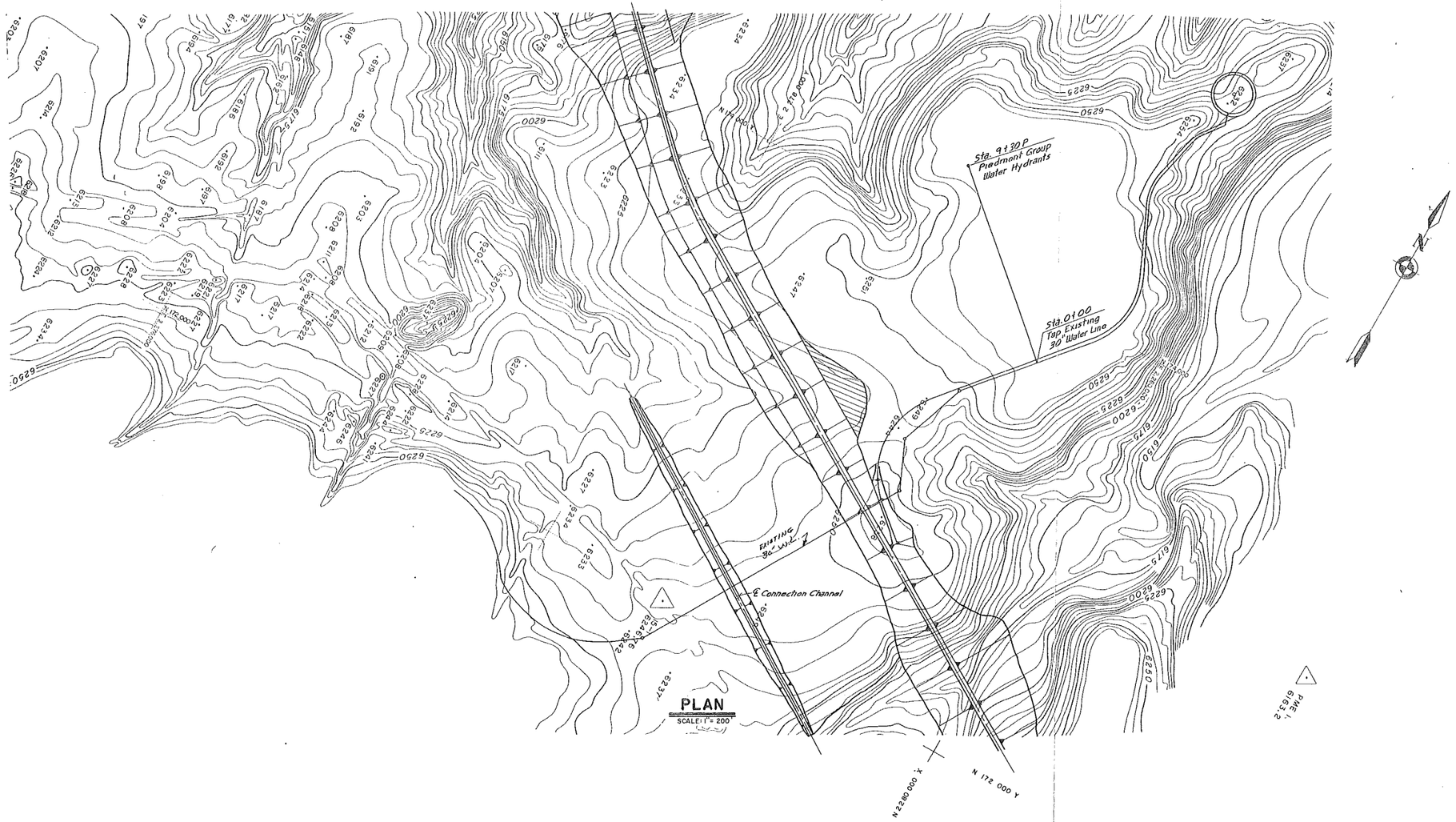
TO ACCOMPANY DESIGN MEMORANDUM NO. 13

DATE: AUG. 1975

FILE NUMBER

PLATE 16

VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



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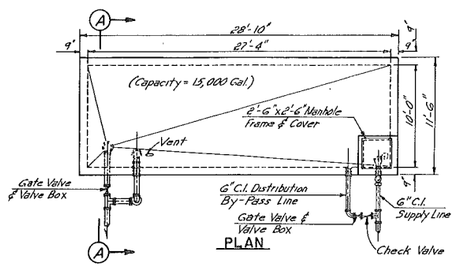

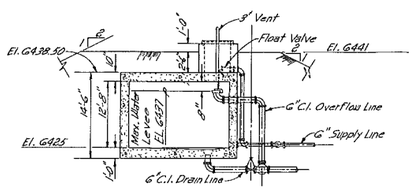

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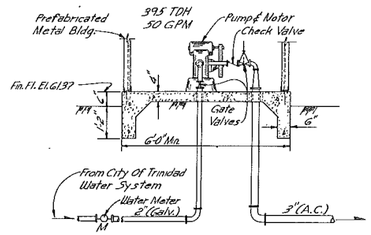

PUMPING STATION SECTION
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US ARMY ENGINEER DISTRICT, ALBUQUERQUE
CORPS OF ENGINEERS
ALBUQUERQUE, NEW MEXICO

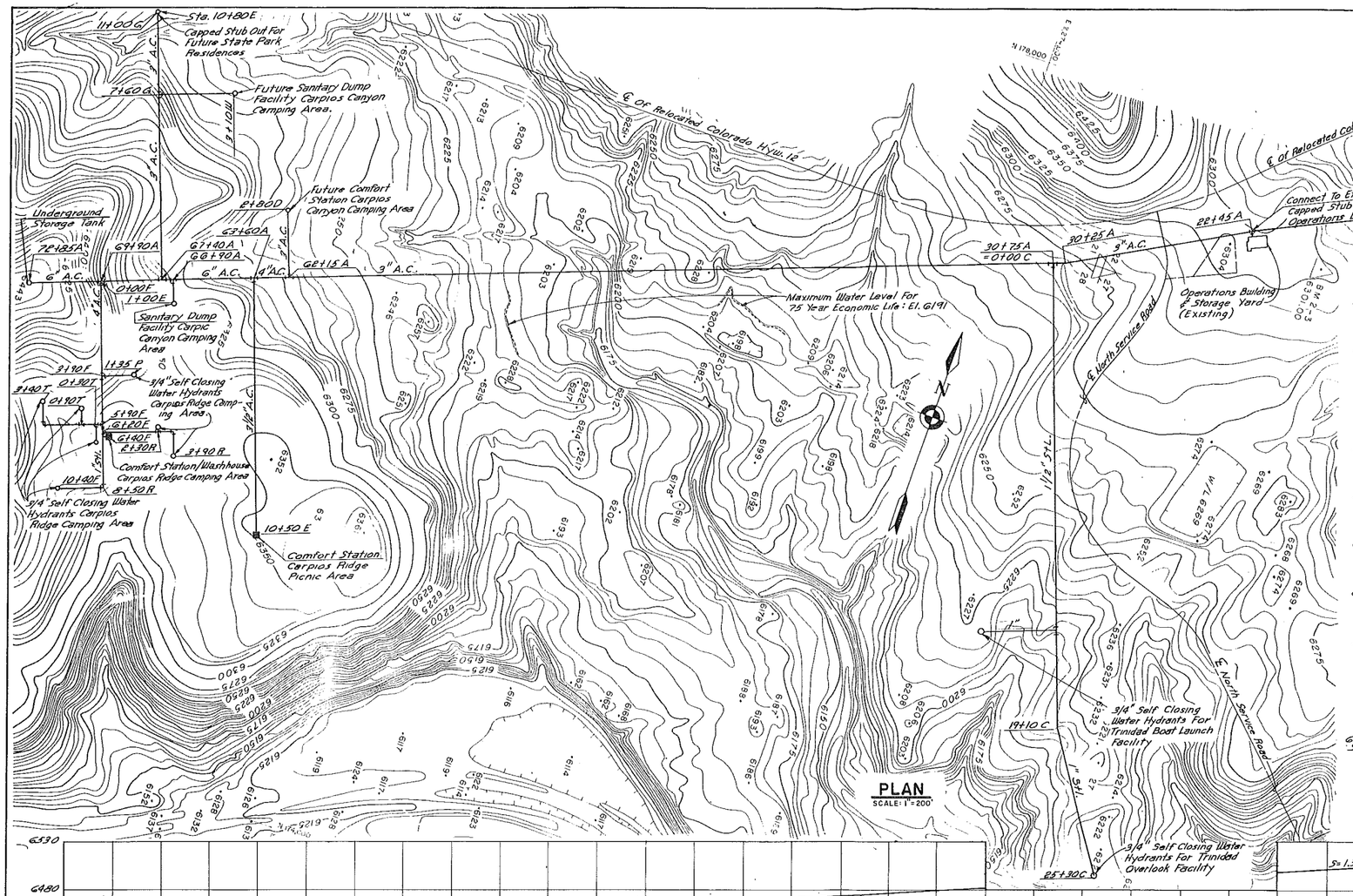
ARKANSAS RIVER WATERSHED — PURGATOIRE RIVER, COLORADO

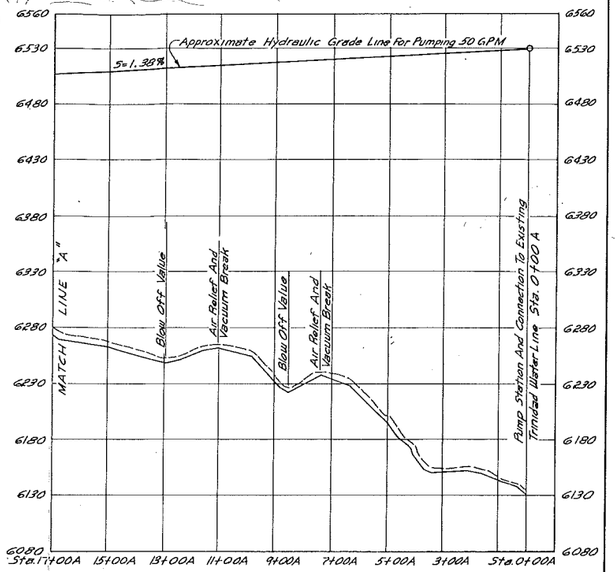
TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS

WATER SUPPLY SYSTEM

PLANS AND SECTIONS

DESIGNED BY: J. WINGET	
DRAWN BY: R. MONTOYA	
CHECKED BY: J. WINGET	
TO ACCOMPANY DESIGN MEMORANDUM NO. 13	FILE NUMBER ARR-DM-J-17
DATE: AUG 1975	PLATE 17





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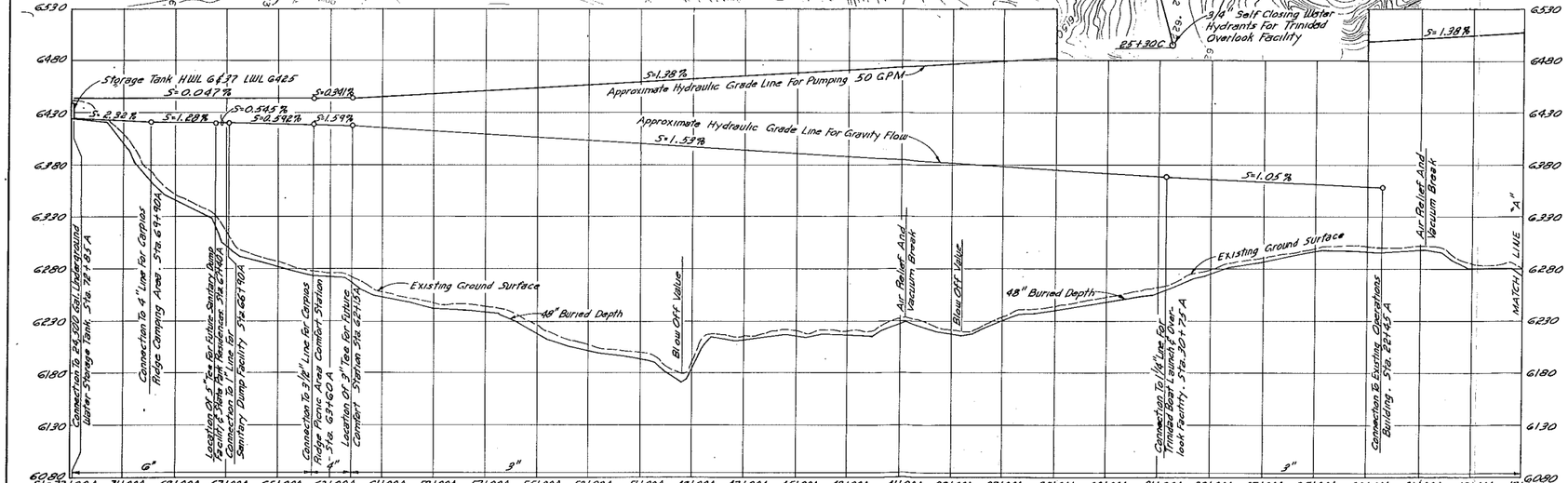

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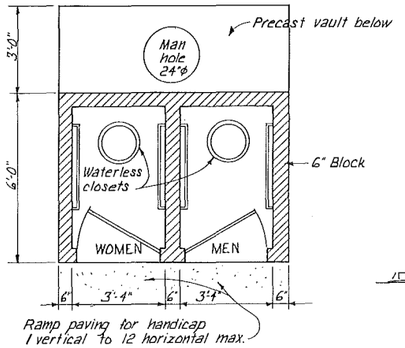
TO ACCOMPANY DESIGN MEMORANDUM NO. 13 DATE: AUG 1975	FILE NUMBER: ARR-DM-J-18 PLATE: 18



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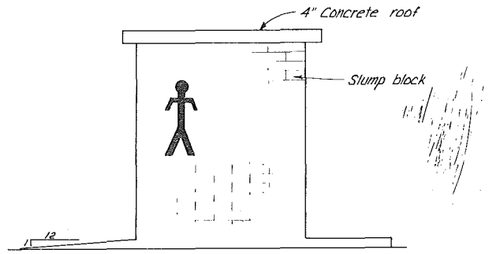

SIDE ELEVATION

SEALABLE VAULT TOILET

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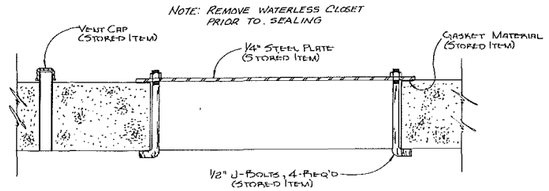

SEAL DETAIL

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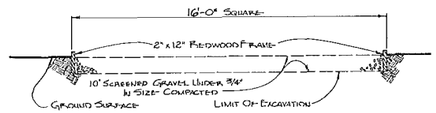

CROSS SECTION

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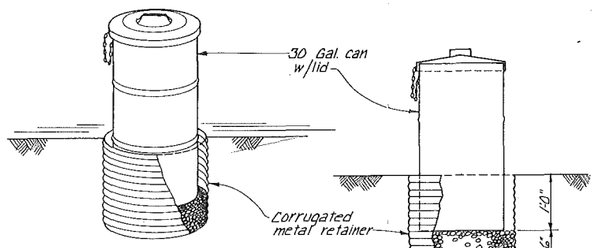

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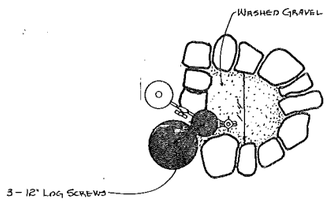

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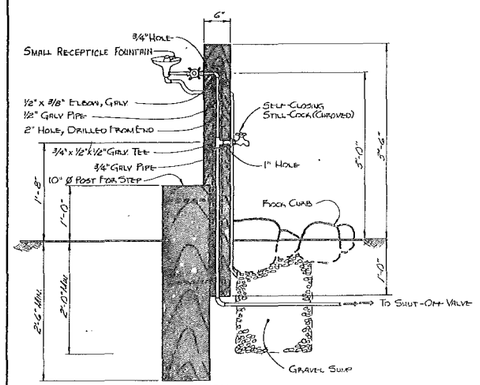

ELEVATION

FOREST FOUNTAIN

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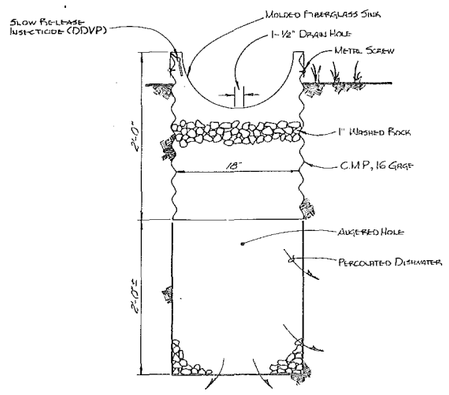

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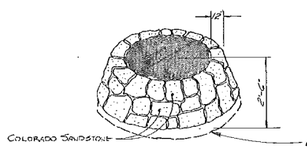

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SCALE: 1/2" = 1'-0"

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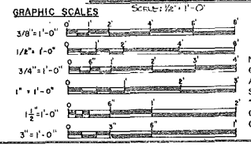

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TRINIDAD LAKE PROJECT
MASTER PLAN
RECREATION AREAS

MISCELLANEOUS DETAILS

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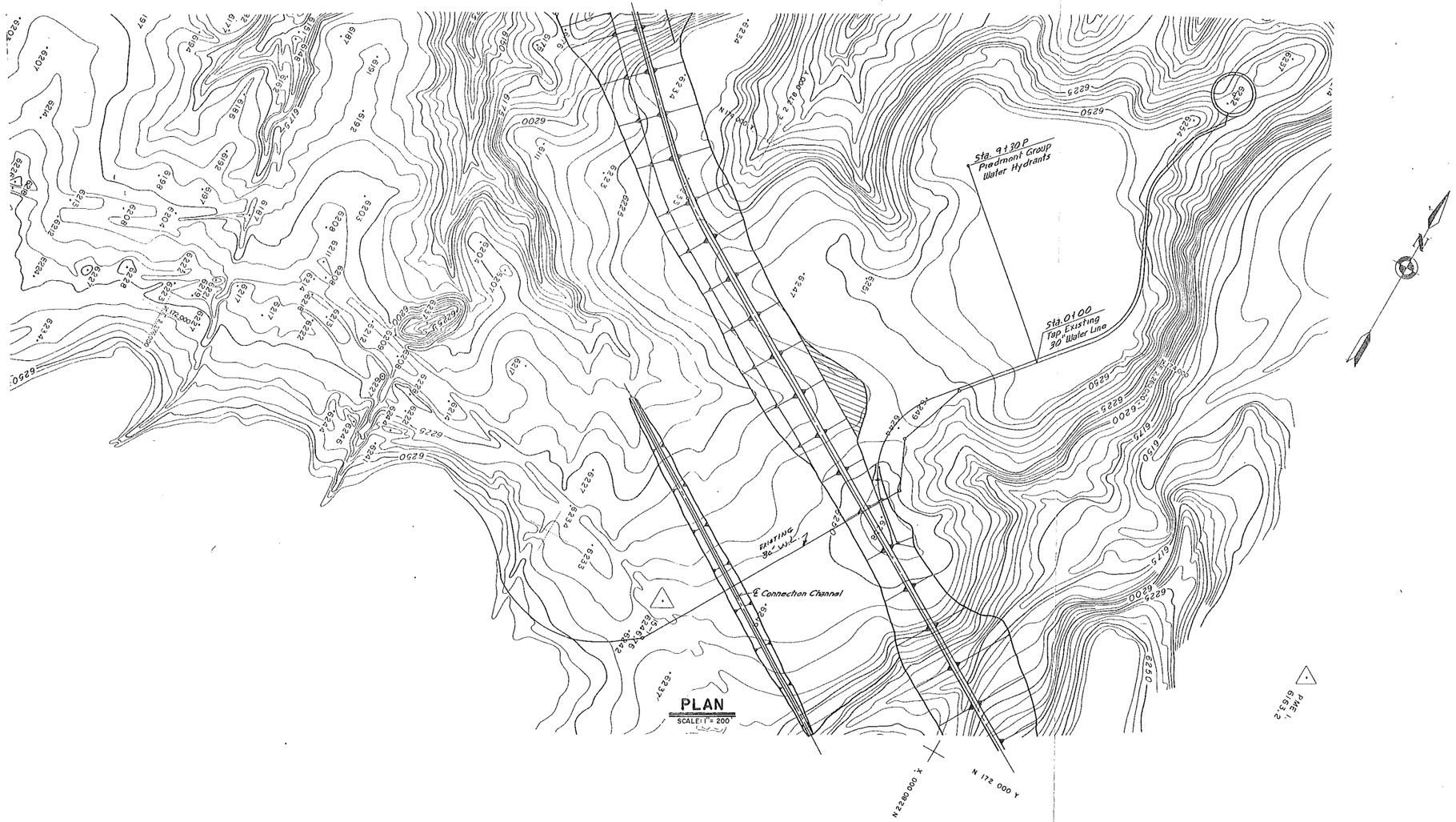
VALUE ENGINEERING PROPOSALS MEAN HIGHER PROFITS



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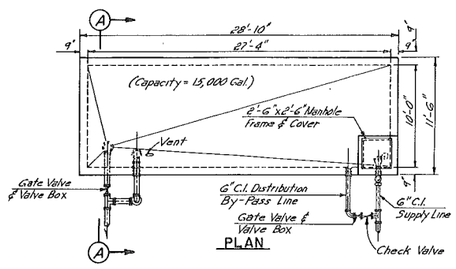

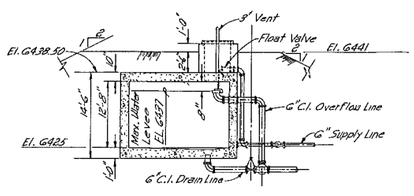

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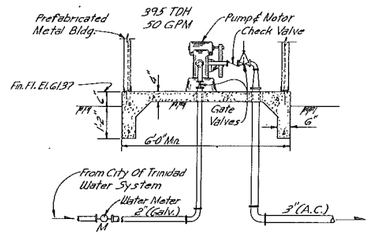

PUMPING STATION SECTION
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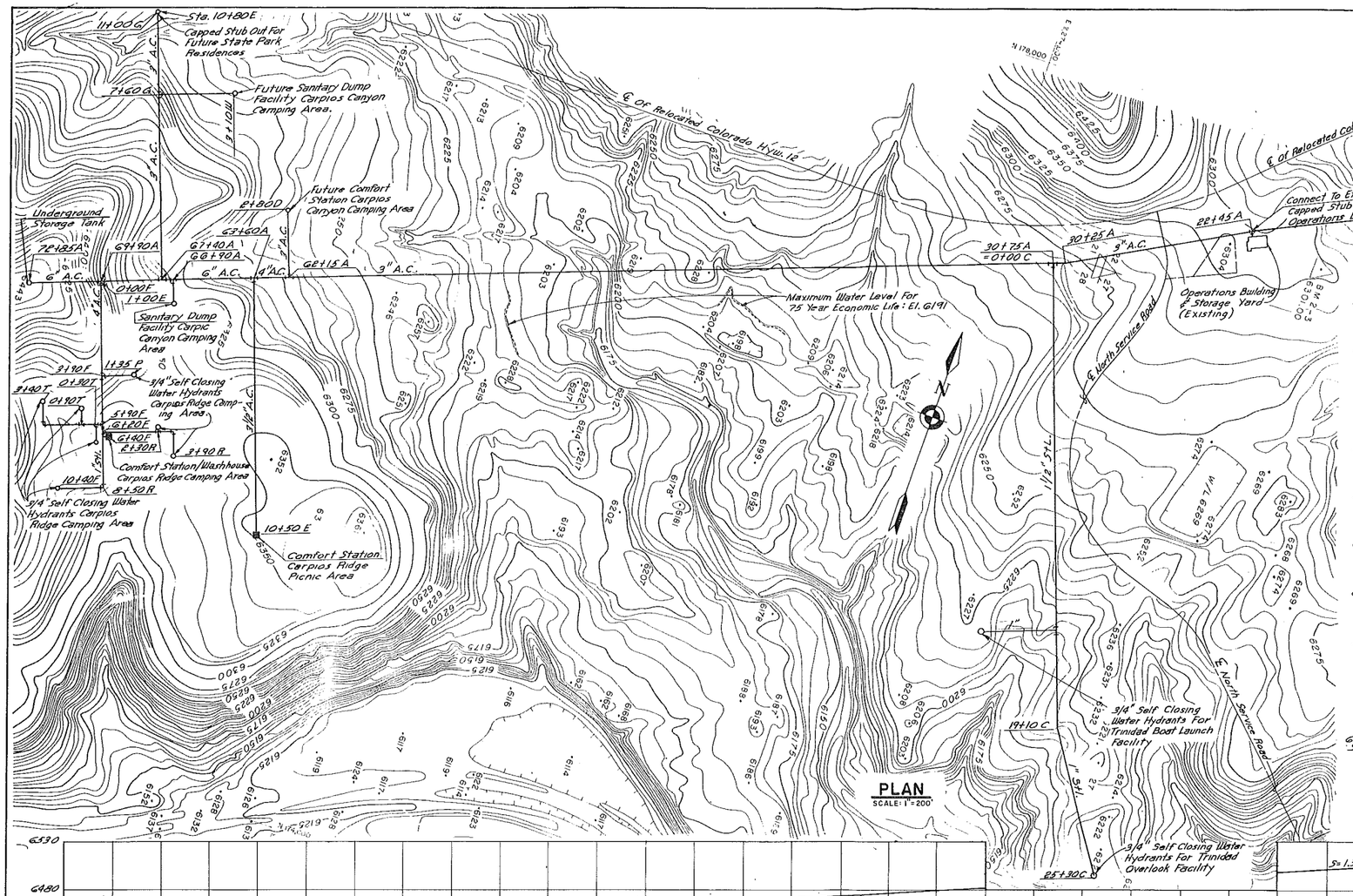
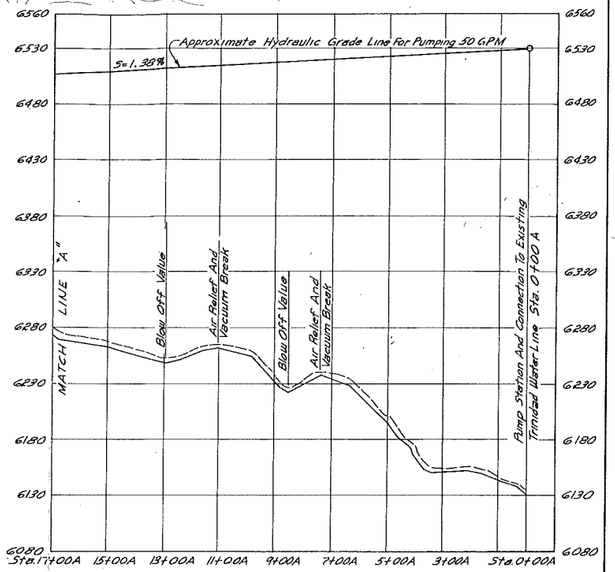
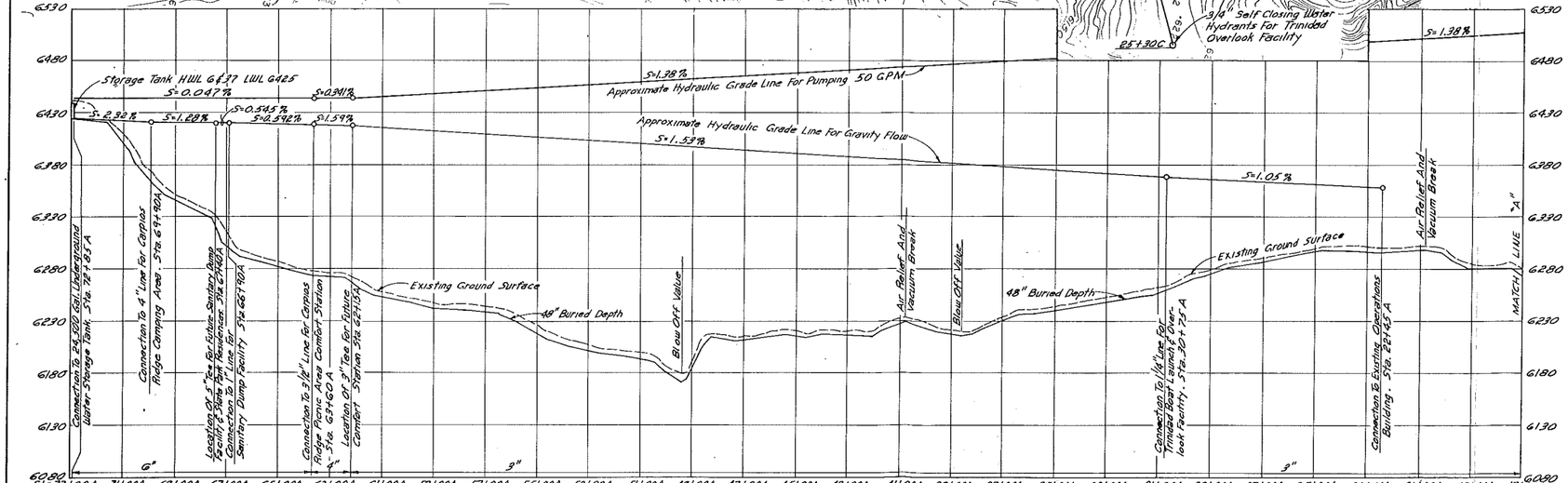




PROFILE LINE "A"



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EXHIBITS

EXHIBIT 1
TRINIDAD LAKE
VISITATION ESTIMATES

1. Recreation participation estimates projected in Design Memorandum No. 3, Appendix C, and used in the Preliminary Master Plan (Design Memorandum No. 4A) were as follows:

General Recreation	112,800
Fishing	24,360
TOTAL	137,160
An additional 6,000 activity days were later added for wildlife oriented activities such as nature study and observation that were not considered in the initial benefit estimates. This number was agreed upon in consultation with Fish and Wildlife Service, River Basin's personnel, located in Denver, Colorado	6,000
NEW TOTAL	143,160

a. Assuming annual visitation to equal approximately 85% of the annual activity days, annual visitation would thus be 122,000.

2. ER 1120-2-403, Para. 3 requires reference to Technical Report No. 2 in projecting visitation estimates. Because of the relatively small average recreation pool which will be available at Trinidad Lake (about 500 acres), a comparison was made with projects listed in Technical Report No. 2 (Corps of Engineers) having small average recreation pools. Selected projects were:

Project	Average Acres Recreation Pool	1968 Attendance
Hords Creek, Texas	510	136,500
Terminus, California	570	328,900
Success, California	600	486,300
Englebright, California	750	104,200
Heyburn, Oklahoma	980	289,000

3. Mean travel zone participation rates were extrapolated from these projects, rejecting the high and low increments of each summation and avoiding other obvious sources of bias. The

process is summarized below;

a. Gross population estimated, Trinidad Lake

TRAVEL ZONES

	I (0-10mi)	II (10-20mi)	III (20-30mi)	IV (30-40mi)	V (40-50mi)	VI (50-75mi)
Colorado	11,419	2,463	901	6,202	2,258	86,058
New Mexico	0	7,031	300	311	2,117	9,916
TOTAL	11,419	9,494	1,201	6,513	4,435	95,974

b. Projected gross annual visitation from within 50 miles of Trinidad Lake, using project visitation rates from Technical Report No. 2:

Zone Use Rate	Zone Use Rate Source Applied to Trinidad Population Zones Equals Projected Visitation:
(1) Hords Creek, Texas	377,265
(2) Success, California	163,034
(3) Terminus, California	61,164
(4) Englebright, California	145,660
(5) Heyburn, Oklahoma	96,045

c. Reject b(1) and (3). mean of remainder = 134,913

d. Reject high and low zonal per capita use rates from b(1) and (5). Means of remaining per capita use rates are:

Zone I	Zone II	Zone III	Zone IV	Zone V
10.09	1.98	.61	.29	.13

e. These rates applied to Trinidad Lake zonal populations provide a total annual visitation estimate of 137,215 from within 50 miles.

f. The neighboring mountains at Trinidad Lake form a significant geographic barrier. The nearby state line is a significant political factor. Alternative leisure opportunity is found

in and beyond the mountains, and beyond the state line. Judgmental discounts for these limitations are conservatively applied here to per capita use volumes as follows:

	Zone I	Zone II	Zone III	Zone IV	Zone V	Zone VI	Zone VII
Colorado	0%	0%	10%	15%	15%	20%	30%
New Mexico	0%	10%	10%	10%	15%	20%	30%

g. Modified computation on these bases:

	Zone I	Zone II	Zone III	Zone IV	Zone V
Colorado	115,218	4,877	495	1,529	250
New Mexico	0	12,539	165	81	240
Total	115,218	17,416	660	1,610	490

Grand Total 135,394 projected annual visitation from within 50 mile radius.

h. The three total annual visitation estimates from within a 50 mile radius as variously computed above are:

(1) 134,913

(2) 137,215

(3) 135,394

The mean is 135,841.

i. Projected visitation from beyond 50 miles = $\frac{135,841}{.70*}$ less 135,841 = 58,217 less 25%** = 43,663.

* Approximated from John Martin Reservoir Recreation surveys to date.

** Prorated from paragraph f, above.

j. Total annual visitation projected by this means: 135,841 + 43,663 = 179,504.

k. This estimate by itself was considered tenuous, particularly in view of the different geographical and social factors affecting the referenced projects which may not be applicable to a project in the Rocky Mountain States. An additional project

example was therefore selected from Technical Report No. 2 for supplementary review.

4. Fort Supply Reservoir, Oklahoma has a much larger average recreation pool than Trinidad Lake will have (1,900 surface acres vs. 500 surface acres). However the zonal population distribution is generally more comparable than that of the projects considered in paragraphs 2 and 3 above.

Populations of Travel Zones

	Zone I	Zone II	Zone III	Zone IV	Zone V
Ft. Supply, Okla.	2,430	9,790	9,550	5,360	9,210
Trinidad Lake, Colo.	11,419	9,494	1,201	6,513	4,435

a. There are no competing water resources at Fort Supply, while more than 5,000 acres are available within 50 miles of Trinidad Lake. In addition, demographic, geographic, and ethnic differences between the two project locations make realistic comparison untenable. As a matter of interest, however, Fort Supply per capita use rates were applied to Trinidad Lake population zones. An annual visitation rate of 216,800 from within 50 miles was thus computed and rejected as excessively deviant.

5. The John Martin Reservoir Project is located about 125 miles northeast of Trinidad. While recreation survey data from this project is not adequate for detailed statistical analysis, it provides a basis for discussion and comparison. (See the John Martin Reservoir Project Master Plan, updated 1972).

a. Per capita use rates for sightseeing, picnicking and fishing from within a 50 mile radius of John Martin Reservoir were computed. These rates were 1.20, 1.00 and 0.87, based on survey data available and an average annual total participation in activity days.

b. These rates and the rate of total participation by classified activity were transposed to the Trinidad Lake Project through the formula: $Tc = \frac{RP}{1-N}$ where:

Tc = total annual activity days, by class

R = 50 mile radius per capita use rate by classified activity (John Martin Reservoir Project).

P = Trinidad Lake Project 50 mile radius population

N = Percentage of classified activity participants from outside the 50 mile zone

c. Gross average annual participation in these activities thus projected is:

Sightseeing	55,611
Picnicking	38,039
Fishing	32,846

d. Gross average annual activity days for all activities at Trinidad Lake was projected through the formula:

$T = \frac{(Tc)(x)}{Z}$ where:

T = Total of all annual activity days.

Tc= Total annual activity days, by class.

Z = Percentage of annual activity days constituted by a classified activity.

e. The three computations based on John Martin recreation surveys and projected participation at Trinidad Lake provided an average of 180,063 total annual activity days projected.

f. The number of average annual visitor days is computed as:

Annual Activity days x .85 = 153,536

6. The Statewide Comprehensive Outdoor Recreation Plans for Colorado, 1970, and New Mexico, 1971, and their supporting documents provide a wealth of demand and supply data. Direct application of those data to a specific problem such as visitation projection at the Trinidad Lake Project has serious limitations. The New Mexico Plan, and new unpublished data for Colorado show recreation participation by region and on a per capita basis. This is conceptually very helpful, however application at a specific project site is difficult. Figure E1-1 shows that although per capita use rates by a given population are demonstrable, the relationship to actual participation at a specific site may not be at all clear. For example, the Colorado Recreation Region 2 per capita participation rate for picnicking is shown to be 9.46. At John Martin Reservoir in this region, the on site per capita picnicking use by the population within a 50 mile radius is 0.87.

7. a. A comparison was made of activity participation percentages of three water based parks in eastern Colorado. Evidence of similar use patterns was anticipated but this thought appears to be completely refuted by the comparison data shown in Table 1-1.

TABLE 1-1
PERCENT OF MEAN VISITOR DAYS
COMPRISED BY MEAN ACTIVITY DAYS

Activity	John Martin Reservoir (mean visitation = 217,230)	Lathrop State Park (mean visitation = 360,756)	Bonny State Park (mean visitation 249,948)
Camping	10.4%	8.8%	18.4%
Picnicking	24.5%	1.5%	4.0%
Swimming	13.6%	0.5%	5.3%
Fishing	21.2%	11.4%	38.1%
Boating	-	1.7%	10.0%

b. It is evident that participation projections based on comparison with other parks may be extremely unreliable. Even the matter of "competing" opportunity may have serious relevance only in terms of user values which are defined after an alternative is available. The role of fees in participation is unclear but undoubtedly has an effect on participation in some day use activities.

8. Consumer appraisal of recreation site attractiveness is based on many variables. These include not only proximity and water area available, but the quality of the resources and the visitor's own conception of quality. "Competing" opportunity is mainly significant in terms of quality, secondarily in terms of proximity and cost.

a. Recreation resource "quality" is assessed by the visitor on the basis of experience and personal values. Examples of visitor assessment which turned out differently than anticipated by the recreation planner are available on every hand. Reasons range from planner experience limitations and budgetary pressure through a wide realm of unknowns concerning human behavior.

b. At a new and untried recreation site, projections in kind and nature beyond obvious needs in the immediate area are risky.

This premise is observed throughout development recommendations in this Design Memorandum.

9. To arrive at a gross basic estimate of average visitation, the various estimates discussed are averaged as follows:

a.	Initial estimate (143,160 activity days x .85)	121,686
b.	(From 3b, above) (134.913 ÷ .70)	192,733
c.	(From 3e, above) (137,215 ÷ .70)	196,021
d.	(From 3g, above) (135,394 ÷ .70)	193,420
e.	(From 3j, above)	179,504
f.	(From 5f, above)	153,536
	Mean of above estimates	172,817

10. The mean estimate of 172,800 annual visitors is regarded as a tentative average figure under conditions featuring a permanent recreation pool, adequate facility development to enable participation (not necessarily "full" development), and free of user fee assessments, under conditions where access were equally available and desirable to all persons within a 50 mile radius.

11. Two major geographic factors will influence total visitation and activity participation rates at Trinidad Lake. The first is the nearby political boundary between Colorado and New Mexico. Of the population within a 50 mile radius of the project, 9,918 (29.7%) live in New Mexico.

a. The Sangre de Cristo range of the Rocky Mountain chain rises to the west of Trinidad Lake. Persons living in or beyond the mountains are unlikely to regard Trinidad Lake as a major recreation source for most activities. The 3,900 Colorado residents of this area comprise another 11.8%of the 50 mile radius population.

b. The geographic influence on visitation patterns at Trinidad Lake is expected to be significant and is expected to be activity-specific. It is apparent that 41.5% of the 50 mile radius population will be affected to some degree by these factors.

12. It is expected that fishing will be the single activity most influenced by geographic factors and political boundaries.

Colorado residents in the mountain region have a number of trout fishing alternatives. This will affect potential fishing activity at Trinidad Lake to some extent but in a minor way that will be offset by non-resident tourist fishermen.

a. Residents of New Mexico Recreation District 2 within the 50 mile radius have adequate, if less than abundant fishing resources. There are not less than 8 small lakes with a total of about 1200 surface acres which are available to the public. In addition, about 50 acres of private reservoir water has limited availability, and about 300 surface acres of private water in the Vermejo Lakes is highly restricted. About 60 miles of stream fishing is also very restricted on the Vermejo ranch, and about 50 miles of stream fishing is available elsewhere in the 50 mile zone, mostly with some limitation on public access.

b. Species available to the New Mexico fishermen within or just outside the 50 mile radius from Trinidad Lake include brown, rainbow, cutthroat and brook trout, largemouth bass, northern pike, bluegill, channel catfish and bluegill. The number of New Mexico fishermen who will choose to pay non-resident fees to fish at Trinidad Lake is expected to be minimal.

13. The 1971 New Mexico Statewide Comprehensive Outdoor Recreation Plan indicates that basic resources for water skiing, boating, and camping in District 2 are considered adequate through the year 1990. Fishing resources are similarly classified with an emphasis on management and development. Visitation from New Mexico for these activities will also be limited and may be influenced by registration requirements or fee systems.

14. The gross potential annual visitation projected in paragraph 10 above is 172,817. On the basis of John Martin Reservoir Project visitation data it is presumed that 70% of the visitation would come from within a 50 mile radius. However, as indicated in paragraph 11, 41.5% of this population will be influenced by significant geographic factors. Assuming that the total visitation by this population (41.5% of 50 mile zone) will be reduced by at least 30%, the potential annual visitation estimate is thus adjusted:

172,817 x 70% x 58.5% = 70,768 (Annual visits for 50 mile zone area not geographically affected)

172,817 x 70% x 41.5% x 70% = 33,872 (Maximum annual visits from 50 mile zone area geographically affected)

172,817 x 30% x 90% = 46,660 (Potential annual visits from beyond

50 miles, less 10% because of mountain barrier to the west and alternative opportunity in New Mexico)

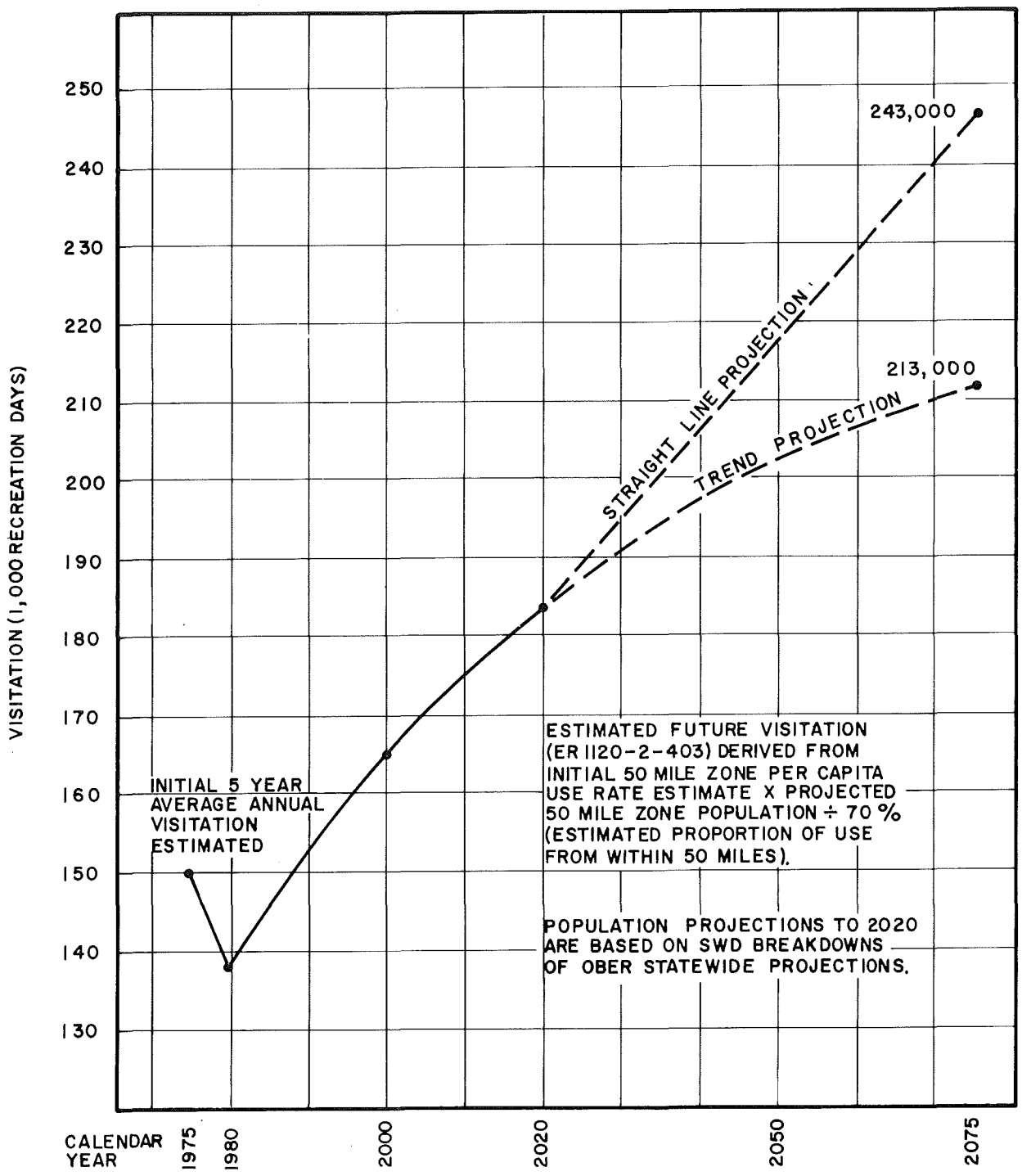
New projected annual visitation = 151,300

(46,600 visits projected from beyond 50 miles = 30.9% of total)

15. As shown in Exhibit 2, initial visitation rates may be warped downward by as much as 25,250 annual visits due to ethnic and economic factors in the project vicinity. The 151,300 visits shown in paragraph 14, less 25,250 = 126,050. The original estimate of 122,000 annual visits may prove to be quite close to actual first year visitation. The conditions represented by Exhibit 2 ethnicity and participation data are very generalized; however, and only indicate the probability of a trend. Further observation and specific survey data from Trinidad Lake concerning ethnicity and recreation participation are suggested. No design load modifications are recommended on this basis.

16. A declining population trend has been in effect in the project area for several years. Population projections anticipate a continuation of the decline until around 1980, then a trend reversal and by 1985 a 50 mile zone population and theoretical recreation demand equal to or greater than in 1975. The trend reversal could begin earlier, depending on economic conditions in the area. Since visitation projections show a return to the estimated initial visitation demand within ten years, no design load modifications are recommended with respect to the current population trend.

The estimate of 150,000 annual visitors is employed as a target figure for 5-year visitation throughout this Design Memorandum. It is definitely subject to the vagaries of human behavior already discussed, as well as social, economic, ethnic, geographic and judgmental factors which are better appraised in hindsight.



ESTIMATED VISITATION PROJECTIONS

FIGURE EI-1

EXHIBIT 2

EXPLORATION OF ETHNIC
INFLUENCES AND NEEDS IN PROJECT AREA
RECREATION PATTERNS

1. Economic and demographic factors in recreation participation are recognized as significant. Economic considerations are better understood and more easily identifiable than social and cultural influences.

2. Relatively high proportions of the populations of Las Animas County, Colorado and Colfax County, New Mexico represent several ethnic derivations (Tables 2-1 and 2-2, and Figure 2-1). Available data was closely examined in an effort to identify recreational activities preferred by any ethnic category. No such determination is possible on the basis of information at hand. As shown in Table 2-1 and 2-2, the ethnic structure of project vicinity population is distinctive.

TABLE 2-1*

TOTAL FOREIGN STOCK
(1st and 2nd Generations)

Las Animas Co., Colorado	20.46%
Colorado, Statewide	12.68%
Colfax Co., New Mexico	9.68%
New Mexico, Statewide	8.73%

TABLE 2-2*

ORIGIN AND PERCENTAGE OF MAJOR
FOREIGN STOCK IN POPULATIONS

	Italy	Mexico	Austria	U.K.	Germany
Las Animas Co., Colorado	8.56%	3.18%	1.73%	1.17%	1.02%
Colorado, Statewide	0.97	1.12	0.42	1.20	1.96
Colfax Co., New Mexico	3.12	0.39	1.18	1.19	0.37
New Mexico, Statewide	0.38	3.72	0.15	0.59	0.73

* Data Source: U. S. Census of Population, 1970

3. Differential participation rates in New Mexico appear to be significant only between the "Anglo" and "Spanish-American" groups

(Figure 2-1). This apparent fact cannot be superficially assigned to ethnic preference.

4. Considerable variation in participation rates by ethnic classification was seen between the six Recreation Districts in New Mexico. This is apparently related to population structure in part, and a composite of all Districts (Figure 2-1 was constructed as a model more applicable to the Trinidad area.

5. As indicated in Figure 2-1, the ethnic composition of the 50 mile radius population may specifically influence visitation trends during the early years of project life.

6. There is no doubt that ethnic preferences for some leisure activities exist, or would exist if a given ethnic population were completely free of constraints having higher daily priority. Such preferences are based in part on a desire to maintain traditional values and personal identification with a group. The sociological importance of such personal identifications may increase with the impact of urbanism and industrialization in the nation.

7. No situations of free ethnic preference can be identified with the data available. In all cases where differential participation rates are evident, acquaintance with the circumstances implies that other factors in various combination are in effect, and that they apply to all classified activity participants. The principal factors can be abbreviated as follows:

(a) Social class, as governed by occupation, education, and income. (Controls value patterns and means of participation.)

(b) Relative social and cultural isolation of all groups for all reasons (controls the nature of learned value patterns, dictates the nature and scope of resources-available for exploitation as social and economic opportunity).

(c) The availability of recreation resources, including basic facilities (controls availability of recreation opportunity).

8. The average educational attainment for "Spanish-Americans" in New Mexico is 8.6 years, versus 10.7 years for the "Anglo-American." The average family income for the "Spanish-American" is $6,900 versus $9,469 for the "Anglo-American." It is evident that neither a full opportunity to learn the alternative recreation values available to the public, nor the financial means to participate have yet been achieved by the average Spanish-speaking

New Mexican. No indication of preferred traditional leisure activity patterns is apparent in the survey data available.

9. No need or justification is seen for adjustment of resource availability at the Trinidad Lake Project to accommodate a unique population. Exceptions may be indicated on the basis of specified local interest. Responsibility for special neighborhood needs appears to lie primarily with local planners.

EXHIBIT 3

ESTIMATION OF RECREATION PARTICIPATION RATES AT TRINIDAD LAKE

1. Basis of Estimate. As demonstrated in Exhibit 1, paragraph 7a, activity patterns by visitors at different projects may vary widely. Even the ratio of visitor days: activity days can vary nearly 50% between projects (Table 3-1). Several reservoir projects with small average recreation pool acreages were selected and available pertinent participation data assembled (Tables 3-1, 2, 3, and 4). These data were usually averaged in search of a common thread, the ranges judgmentally appraised and the value apparently most applicable to Trinidad Lake was selected and assigned.

TABLE 3-1

ANNUAL ACTIVITY PARTICIPATION RATES
PROJECTED AT TRINIDAD LAKE
(Based on Activity Participation Rates By
Percentage of Annual Visitation At Selected
Reservoir Recreation Areas)

Activity	John Martin Res., CO *(217,230)	Lathrop State Park, CO *(360,756)	Bonny State Park, CO (249,948)	Hords Creek Res., TX *(195,700)	Terminus Res., CA *(352,928)	Success Res., CA *(524,902)	Englebright Res., CA *(114,644)	Heyburn Res., OK *(329,820)	Mean	Range (less extreme figures)	Estimated Percentage at Trinidad Lake	Projected Annual Activity Days at Trinidad Lake (1)
Camping	10.4%	8.8%	18.4%	28.0%	2.7%	2.3%	5.0%	5.3%	10.1%	2.7-18.4%	15.0%	22,500
Picnicking	24.5	1.5	4.0	30.0	30.3	19.7	55.3	17.3	22.8	4.0-30.3	18.0	27,000
Swimming	13.6	0.5	5.3	16.7	14.7	6.3	46.0	31.3	16.8	5.3-31.3	5.0	7,500
Fishing	21.2	11.4	38.1	45.0	37.3	43.3	15.3	15.7	28.4	15.3-43.3	30.0	45,000
Boating	1.5	1.7	10.0	2.7	3.3	3.7	18.0	3.7	5.6	1.7-10.0	4.5	6,750
Sightseeing	35.8	-	-	14.0	28.0	35.3	25.0	25.0	27.2	25.0-35.3	33.0	49,500
Water Skiing	1.2	-	-	7.7	11.3	9.7	33.3	2.7	11.0	2.7-11.0	4.0	6,000
Other	7.8	-	-	2.0	0.7	0	0.3	1.7	2.1	0.7-2.1	2.0	3,000
Mean ratio, Visitation: Activity Days	1:1.16	-	-	1:1.48	1:1.28	1:1.20	1:1.98	1:1.03	1:1.24	1.20-1.48	1.12	167,250

* Approximate average annual visitation.
*** Mean of weighted averages from Technical Report No. 2
(1) = Percent x 150,000

Table 3-2

PERCENT OF ANNUAL VISITATION
DURING PRIMARY RECREATION MONTHS
AT SELECTED RESERVOIR RECREATION AREAS

PROJECT	April	May	June	July	Aug.	Sept.	Total
John Martin Reservoir, Colo.	9.2%	12.0%	13.2%	15.4%	12.9%	8.8%	71.5%
Lathrop State Park, Colo.	8.4	12.4	16.3	20.8	13.5	6.8	78.2
Bonny State Rec. Area, Colo.	8.2	17.8	17.6	16.2	12.1	8.4	80.3
Hords Creek Reservoir, Tex.	7.4	11.2	16.9	19.6	17.5	10.1	82.7
Terminus Reservoir, Calif.	10.7	14.5	13.6	14.1	13.5	8.7	75.1
Success Reservoir, Calif.	12.4	13.5	13.6	13.6	11.0	8.3	72.4
Englebright Reservoir, Calif.	7.1	11.7	16.9	20.2	16.4	8.7	81.0
Heyburn Reservoir, Okla.	5.6	9.6	17.6	17.5	13.9	10.3	74.5
MEAN	8.6%	12.8%	15.7%	17.1%	13.9%	8.8%	77.0%

Table 3-3

PROJECTED MONTHLY AVERAGE
VISITATION AT TRINIDAD LAKE
(Based on Table 4-2)

April - 8.6% x 150,000 = 12,900
May - 12.8% x 150,000 = 19,200
June - 15.7% x 150,000 = 23,550
July - 17.1% x 150,000 = 25,650
Aug - 13.9% x 150,000 = 20,850
Sep - 8.8% x 150,000 = 13,200

TOTAL = 115,350 = 76.9% of Projected Total Annual Visitation

Table 3-4

MONTHLY ACTIVITY PARTICIPATION RATES
PROJECTED AT TRINIDAD LAKE, COLORADO
(Based on percent of mean monthly visitation constituted by mean activity days at three Colorado reservoirs)

ACTIVITY	John Martin Reservoir, Colo.	Lathrop State Park, Colo.	Bonny State Rec. Area, Colo.	Unqualified Mean Monthly Percentage	Estimated Monthly Percentage at Trinidad Lake	Projected Monthly Activity Days at Trinidad Lake (Re: Table 3-3)	Total Mean Annual Activity Days Projected (Re: Table 3-1)	Percentage of Projected Annual Activity Days
	Percent of Visitation							
Camping								
April	1.9%	2.9%	19.8%	8.2%	10.0%	1,290		
May	7.2	4.9	20.1	10.7	12.0	2,300		
June	12.3	10.5	18.5	13.8	15.0	3,533		
July	19.8	13.4	18.4	17.2	20.0	5,130		
Aug	21.6	18.4	19.6	19.9	20.0	4,170		
Sept	12.6	7.3	9.4	9.8	10.0	1,320		
					Total	17,743	22,500	78.9%
Picnicking								
April	20.4	2.3	4.9	9.2	10.0	1,290		
May	29.5	2.3	5.0	12.3	15.0	2,880		
June	32.6	1.4	4.6	12.9	25.0	5,888		
July	35.0	2.2	4.6	13.9	30.0	7,695		
Aug	33.2	2.1	5.0	13.4	25.0	5,213		
Sept	28.3	1.1	4.4	11.3	15.0	1,980		
					Total	24,946	27,000	92.4%
Swimming								
April	0.0	0.0	0.0	0.0	0.0	0		
May	7.4	1.9	9.2	6.2	5.0	960		
June	21.2	6.2	9.2	12.2	8.0	1,884		
July	28.6	1.0	9.2	12.9	10.0	2,565		
Aug	27.3	1.4	10.0	12.9	8.0	1,668		
Sept	18.5	0.4	6.7	8.5	5.0	264		
					Total	7,341	7,500	97.9%
Fishing								
April	43.9	20.8	66.0	43.6	50.0	6,450		
May	33.0	15.4	67.1	38.5	35.0	6,720		
June	20.2	13.8	30.8	21.6	25.0	5,888		
July	7.6	9.4	30.7	15.9	20.0	5,130		
Aug	8.0	9.5	33.3	16.9	15.0	3,127		
Sept	6.9	11.8	28.2	15.6	15.0	1,980		
					Total	29,295	45,000	65.1%

Table 3-4 (Cont'd)

MONTHLY ACTIVITY PARTICIPATION RATES
PROJECTED AT TRINIDAD LAKE, COLORADO
(Based on percent of mean monthly visitation constituted by mean activity days at three Colorado reservoirs)

ACTIVITY	John Martin Reservoir, Colo.	Lathrop State Park, Colo.	Bonny State Rec. Area, Colo.	Unqualified Mean Monthly Percentage	Estimated Monthly Percentage at Trinidad Lake	Projected Monthly Activity Days at Trinidad Lake (Re: Table 3-3)	Total Mean Annual Activity Days Projected (Re: Table 3-1)	Percentage of Projected Annual Activity Days
	Percent of Visitation							
Boating**								
April	0.6%	1.6%	5.9%	2.7%	2.5%	323		
May	2.1	1.7	9.5	4.4	4.0	768		
June	3.6	2.4	13.0	6.3	6.0	1,413		
July	5.8	1.9	14.9	7.5	7.0	1,796		
Aug	7.4	2.7	16.6	8.9	8.0	1,668		
Sept	6.5	1.9	12.2	6.9	5.0	660		
					Total	6,628	6,750	98.2%
Sightseeing								
April	43.7	—	—	43.7	40.0	5,160		
May	35.0	—	—	35.0	35.0	6,720		
June	33.8	—	—	33.8	30.0	7,065		
July	27.9	—	—	27.9	28.0	7,182		
Aug	29.0	—	—	29.0	29.0	6,047		
Sept	39.3	—	—	39.3	40.0	5,280		
					Total	37,454	49,500	75.7%
Water Skiing**								
April	0.0	—	—	0.0	0.0	0		
May	0.8	—	—	0.8	0.8	16		
June	7.2	—	—	7.2	7.2	1,696		
July	5.5	—	—	5.5	5.5	1,411		
Aug	6.4	—	—	6.4	6.4	1,334		
Sept	8.6	—	—	8.6		1,135		
					Total	5,592	6,000	93.2%
Other								
April	0.5	—	—	0.5		65		
May	2.4	—	—	2.4		461		
June	1.0	—	—	1.0		236		
July	0.8	—	—	0.8		205		
Aug	1.3	—	—	1.3		271		
Sept	0.4	—	—	0.4		53		
					Total	1,291	3,000	43.0%

**1966 & 1967 data only at John Martin Reservoir.

EXHIBIT 4

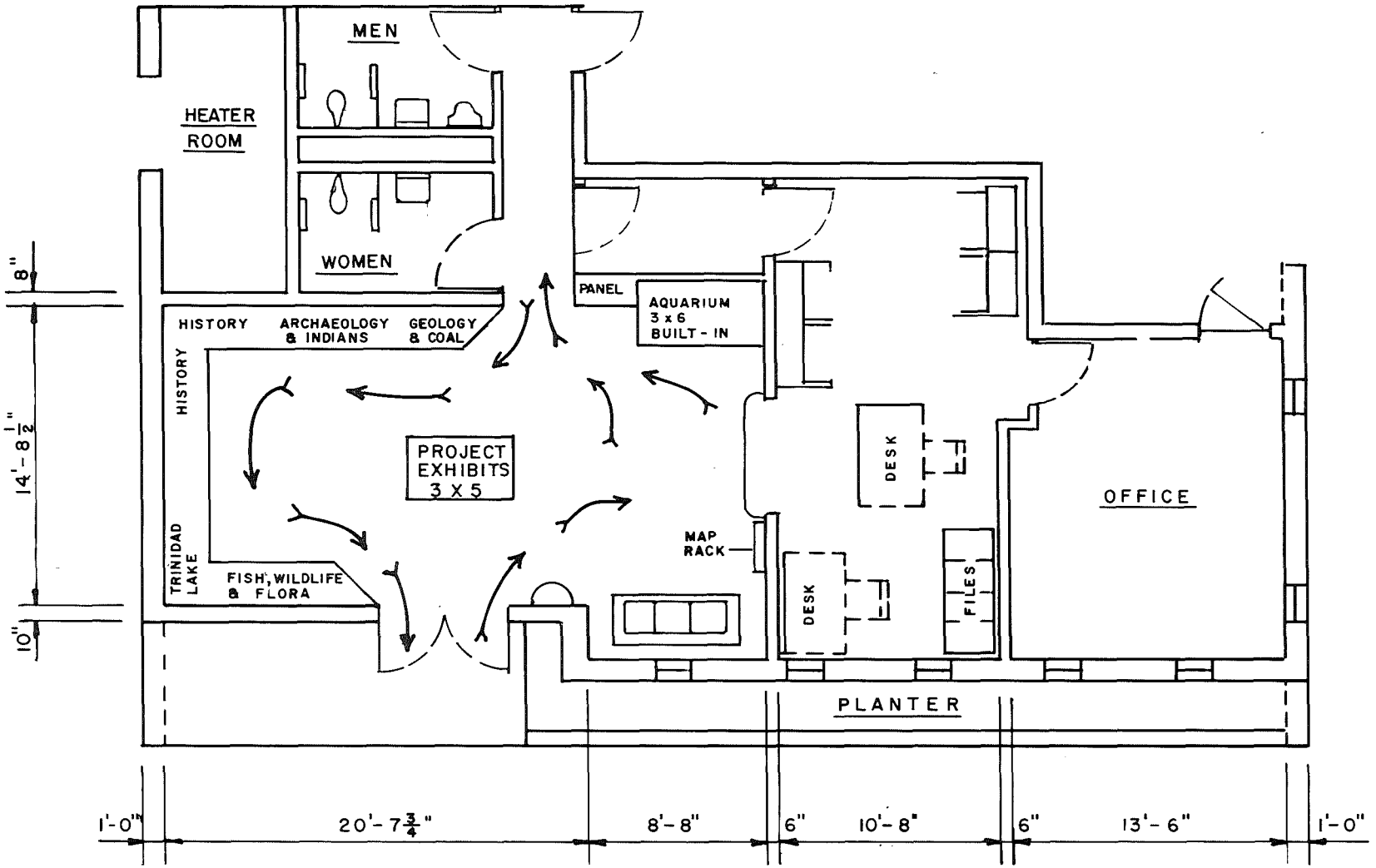
VISITOR CENTER FACILITIES

1. The basic function of the Visitor Center will be to serve as a point of orientation and introduction to the projection. Interpretive exhibits are essential for efficient delivery of the broad introduction required.

2. It is recommended that semi-permanent exhibits be installed by an independent specialist in exhibits and interpretation. The specialist will coordinate with and perhaps let sub-contracts with relevant agencies.

3. The adequacy and effectiveness of the Visitor Center function is to be comprehensively reviewed at each updating of the Master Plan.

4. A tentative layout for interpretation of the area and the projects position in the area-wide context is shown in Figure 4-1.



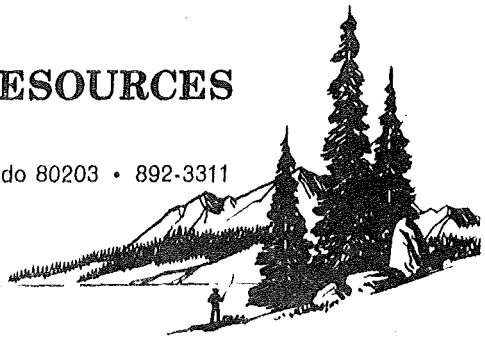
TRINIDAD PLAN FOR EXHIBIT DESIGN

SCALE 1/2" = 1'-0"

EXHIBIT 5

WATER ACQUISITION AND RECREATIONAL
MANAGEMENT ASSURANCES BY THE STATE OF COLORADO

STATE OF COLORADO John A. Love, Governor
DEPARTMENT OF NATURAL RESOURCES
T. W. Ten Eyck, Executive Director
231 Columbine Bldg., 1845 Sherman St. Denver, Colorado 80203 • 892-3311



Board of Land Commissioners
Division of Administration
Division of Mines
Division of Parks & Outdoor Recreation
Division of Water Resources
Division of Wildlife
Geological Survey
Oil and Gas Conservation Commission
Soil Conservation Board
Water Conservation Board

April 27, 1973

Major Leroy W. Paul
Albuquerque District
Corps of Engineers
P. O. Box 1580
Albuquerque, New Mexico 87103

Dear Major Paul:

Under date of April 4, 1973, you made inquiry concerning the position of the state of Colorado with reference to the establishment of a permanent pool as a part of the Trinidad Lake project. Please be advised that the state of Colorado most definitely intends to secure the necessary water to create and thereafter maintain a permanent pool in the Trinidad Lake. We will also assume the management responsibilities for the recreational aspects of the lake.

The operation of the recreational area will be under the jurisdiction of our newly created Division of Parks and Outdoor Recreation. Further coordination in this matter should be obtained by making contact directly with Mr. George T. O'Malley, Jr., Director, Division of Parks and Outdoor Recreation, 6060 Broadway, Denver, Colorado 80216.

Sincerely,

T. W. Ten Eyck
Executive Director

TWTE/dlh

cc: George T. O'Malley

EXHIBIT 6

LETTERS RECEIVED IN RESPONSE TO DRAFT MASTER PLAN AND RESPONSE TO COMMENTS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
AREA OFFICE COLORADO—UTAH
2215 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138

In Reply Refer To

March 12, 1975

District Engineer, Albuquerque District
U.S. Army Corps of Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Sir:

This replies to Mr. Coombes' February 10 letter requesting our review and comments on the Trinidad Lake Master Plan draft. Preparation of the following comments has been coordinated informally with the Colorado State Division of Wildlife, and they are in general agreement with our views.

General Comments

Incorporation of the 4,500 acre-feet, 213 surface-acre minimum pool in Trinidad Reservoir for fishery management and for general public recreational use will do much to fill the need for these water-based resources in the arid region of Trinidad and associated population centers of south-central Colorado. Fishing will become available locally, but, as noted on page 28, only a relatively small wildlife population, supporting only limited hunting opportunities, exists within the project area.

Model Reservoir could provide moderate amounts of waterfowl habitat and hunting, particularly in favorable water years. The reservoir is shown on the project map, Figure 1, but it has not been discussed in the draft plan or its fate described if it is not to be included in the project.

Specific Comments

Summary page ii states that "the Colorado Division of Wildlife will manage an area ... for wildlife," but

there are no specifics in the plan for such an area. Also, page 62, D, Operation: Wildlife Management, states that " ... lands located on the south of the lake ... Long's Canyon area, will be designated as a wildlife management area." Yet again, no specific plan or agreement with the Colorado State Division of Wildlife is mentioned. We suggest that the wildlife management area be discussed in greater detail in the master plan and how it will be administered by the Colorado Division of Wildlife.

Exhibit 1, page E1-1, shows "an additional 6,000 activity days ... added for other fish and wildlife oriented activities." We suggest that the plan should indicate what particular activities are included in the 6,000-day figure and which agency provided the estimate.

We appreciate the opportunity to comment.

Sincerely,

Robert W. Thoesen

Robert W. Thoesen
Area Manager

United States Department of the Interior

BUREAU OF OUTDOOR RECREATION

MID-CONTINENT REGION

IN REPLY REFER TO:
D6427

MAILING ADDRESS:
Post Office Box 25387
Denver Federal Center
Denver, Colorado 80225

STREET LOCATION:
603 Miller Court
Lakewood, Colorado
Telephone 234-2634

MAR 20 1975

Mr. Jasper H. Coombes, P.E.
Chief, Engineering Division
Albuquerque District
Corps of Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

We have reviewed the draft copy of the Trinidad Lake Master Plan provided with your letter of February 10, 1975.

The report indicates an uncertainty as to whether the lake will have a permanent recreation pool. Item C on page 6 states, "In the event that water for a permanent pool cannot be obtained, it is unlikely that the State or any local body will have an interest in assuming management responsibility. Alternatives will be explored if and when warranted by circumstance. Recreation management by the Corps in lieu of State or local management will be based primarily on minimal structural facilities for recreation and the maintenance of public open space for general use."

If the recreation water cannot be obtained on a permanent basis, the operation data for the reservoir should be carefully examined to see if sufficient water might be available during parts of the recreation season to warrant more than minimal recreation developments. Perhaps some scaled-down developments could be built that would provide recreational opportunities not solely dependent upon a recreation pool, still utilizing the enhancement provided by the impoundment when water is available.

Obviously, the best plan is to obtain a permanent pool so the project's full recreation potential can be realized. We trust the Master Plan will be revised to reflect the concerns expressed by the State Division of Parks and Outdoor Recreation.

Sincerely,

Albert G. Baldwin
Assistant Regional Director
Resource Planning Services

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

United States Department of the Interior

NATIONAL PARK SERVICE
ROCKY MOUNTAIN REGIONAL OFFICE
655 Parfet Street
P.O. BOX 25287
Denver, Colorado 80225

IN REPLY REFER TO:
L7423 (RMR)CF

MAR 18 1975

Mr. Jasper H. Coombes, P.E.
Chief, Engineering Division
Department of the Army
Albuquerque District, Corps of Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

Thank you for your letter of February 10 and the draft copy of the Trinidad Lake Project master plan which you enclosed for our review and comment.

No established or studied units of the National Park System will be affected by this project. Moreover, the proposed developments do not appear to adversely affect any site registered as a National Historic, Natural, or Environmental Education Landmark, or any site listed as eligible for such registration.

In the case of historic sites that are listed on the National Register of Historic Places, we know of no adverse impact upon any such sites resulting from this project. We note in this connection that your staff has been working with representatives of the State Historical Society who answer to the State Historic Preservation Officer. However, we suggest that when the proposed master plan is completed in final copy, it include with other letters in the Appendix, his letter of comment. This represents valuable supportive documentation. He is Mr. Stephen H. Hart, Chairman, State Historical Society, Colorado State Museum, 200 14th Avenue, Denver, Colorado 80203.

For your further reference we offer several more specific comments below:

4-03, pp. 24-25: Spanish Peaks have been recommended by the staff of the Pike-San Isabel National Forests for designation by the Secretary of the Interior as natural landmarks. You

CONSERVE AMERICA'S ENERGY

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may wish to cite this fact in the final master plan, or contact this office before that document is completed to ascertain whether it has been so designated.

4-04, pp. 25-26; 5-13, p. 56; 9-05, p. 75. In these several sections we noted references to salvage operations for the purpose of preservation and interpretation of archeological remains. This is a matter of concern and your comment in 9-05, p. 75, raises several questions: "Archeological investigations and salvage operations are being conducted on project lands to eliminate this feature as a problem area." Our questions and comment in this connection follow:

1. How does the statement from your Draft Master Plan, Design Memorandum No. 13, cited above, relate to the environmental impact statement for the proposed project?

2. What alternatives were considered in the environmental impact statement?

3. Have the archeological sites identified been evaluated against National Register criteria?

4. If they have been determined to be eligible for inclusion in the National Register, has the Section 106 process of the National Historic Preservation Act of 1966 been completed?

Unless the points raised have been positively addressed, your statement as cited above is premature. Within professional circles it is considered to be the soundest procedure to leave archeological remains in the ground, undisturbed for investigation by future generations. Salvage operations, as you indicate are intended within the proposed project area, are considered to be only a last resort.

4-04, p. 26, line 16: The correct reference is National Register of Historic Places.

4-04, pp. 25-26: There is no mention of the Santa Fe Trail. It would be desirable to include a reference to it in the final master plan document with accompanying brief statement of what effect, if any, the proposed developments will have upon it.

4-05, p. 28, line 14: Change "father" to farther or further.

5-15, pp. 56-58: It would be desirable if the final master plan were to address more explicitly the impact of this project upon ecological resources. The draft includes a number of general references, but we believe the matter of the endangered flora and fauna, as well as the impact of the proposal upon the wildlife habitats, could have been more completely treated.

The document as prepared makes a good impression and reflects a great amount of work in its preparation. Moreover, we appreciate the opportunity to furnish you with our comments which have been prepared in a spirit of cooperation and respect for the basic underlying philosophy of a project of such magnitude.

Sincerely yours,

for Richard A. Strait
Associate Regional Director,
Cooperative Activities

RESPONSE TO COMMENTS IN PRECEDING LETTER

Item 4-04. Comments in this section have been discussed in the final Trinidad Lake environmental statement, presently on file with the President's Council on Environmental Quality. It is our opinion that the Corps has not only complied with the letter of the law but with the spirit of the law as well in its treatment of archeological resources. In this regard we are incorporating two letters received from the State Historical Society regarding archeological resources at Trinidad Lake.

Item 5-15. Customarily, the environmental impacts of a project are not discussed in any great depth in the master plan. While the master plan is influenced by certain environmental concerns surfaced in the environmental statement, it is this document that is directly concerned with ecological impacts. Also, the master plan is basically an "in house" document and extensive discussions of environmental issues are purposely curtailed.

THE STATE HISTORICAL SOCIETY OF COLORADO

State Archaeologist, 5A Ketchum Bldg., University of Colorado, Boulder 80302

June 24, 1975

Jasper H. Coombes
Department of the Army
Corps of Engineers
P.O.Box 1580
Albuquerque, New Mexico 87013

Dear Mr. Coombes:

I have read the final Environmental Impact Statement for the Trinidad Lake project. In the opinion of this office the archaeological remains have been adequately surveyed and salvaged. Therefore this office can provide the necessary archaeological clearance.

Sincerely,

James J. Hester

James J. Hester
Acting State Archaeologist

THE STATE HISTORICAL SOCIETY OF COLORADO

Colorado State Museum, 200 Fourteenth Avenue, Denver 80203

April 30, 1975

Jasper H. Coombes, P.E.
Chief, Engineering Division
Albuquerque District
Army Corps of Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

Thank you for the copy of the Final Environmental Impact Statement for the Trinidad Lake Project.

There has been several subsequent letters and correspondance regarding the project and the National Register nominations. We would like this reflected in the statement.

We wish to thank you and your staff and especially Mr. Stephen Ireland for the work done on the nominations. We have no further comment to make in repsect to the project at this time.

Again thank you for your interest in preservation.

For the Colorado State Historic Preservation Office

Cynthia Emrick
Preservation Assistant

Susan Treadway

Susan Treadway
Environmental Coordinator

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. Box 17107, Denver, Colorado 80217

March 10, 1975

Mr. Jasper H. Coombes, P.E.
Chief, Engineering Division
Department of the Army
Albuquerque District Corps of Engineers
P. O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

We have reviewed the draft Trinidad Lake Project Master Plan as requested by your office.

In our opinion, this is an all-encompassing statement that gives due recognition to potential environmental impacts. We are especially impressed by:

(1) The planned recreational considerations

(2) Stated plans on page 70 to adequately treat and revegetate areas disturbed by construction operations.

No Soil Conservation Service projects will be affected by your proposed project.

We appreciate the opportunity to review and comment on this draft.

Sincerely,

M. D. Burdick
State Conservationist

cc: Council on Environmental Quality, Washington, D.C. (5 copies)
Dr. Fred H. Tschirley, Office of the Secretary, USDA, Washington, D.C.

Advisory Council
On Historic Preservation
[illegible]
Washington D.C. 20006

MAR 2 7 1975

Mr. Jasper H. Coombes, P.E.
Chief, Engineering Division
Corps of Engineers, Albuquerque District
U.S. Department of the Army
P. O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

This is in response to your request of February 10, 1974 for comments on the draft environmental statement for Master Plan Design Memorandum No. 13, Trinidad Lake Project, Purgatoire River, Colorado. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council has determined that while you have discussed the historical, architectural, and archeological aspects related to the undertaking, the Advisory Council needs additional information to adequately evaluate the effects on these cultural resources. Please furnish additional data indicating:

I. Compliance with Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470[f]). The Council must have evidence that the most recent listing of the National Register of Historic Places has been consulted (see Federal Register, February 4, 1975, and monthly supplements each first Tuesday thereafter) and that either of the following conditions is satisfied:

   A. If no National Register property is affected by the project, a section detailing this determination must appear in the environmental statement.

   B. If a National Register property is affected by the project, the environmental statement must contain an account of steps taken in compliance with Section 106 and a comprehensive discussion of the contemplated effects on the National Register property. (Procedures for compliance with Section 106 are detailed in the Federal Register of January 25, 1974.)

II. Compliance with Executive Order 11593 "Protection and Enhancement of the Cultural Environment" of May 13, 1971.

   A. Under Section 2(a) of the Executive Order, Federal agencies are required to locate, inventory, and nominate eligible

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress on the field of Historic Preservation.

historic, architectural and archeological properties under their control or jurisdiction to the National Register of Historic Places. The results of this survey should be included in the environmental statement as evidence of compliance with Section 2(a).

B. Until the inventory required by Section 2(a) is complete, Federal agencies are required by Section 2(b) of the Order to submit proposals for the transfer, sale, demolition, or substantial alteration of federally owned properties eligible for inclusion in the National Register to the Council for review and comment. Federal agencies must continue to comply with Section 2(b) review requirements even after the initial inventory is complete, when they obtain jurisdiction or control over additional properties which are eligible for inclusion in the National Register or when properties under their jurisdiction or control are found to be eligible for inclusion in the National Register subsequent to the initial inventory.

The environmental statement should contain a determination as to whether or not the proposed undertaking will result in the transfer, sale, demolition or substantial alteration of eligible National Register properties under Federal jurisdiction. If such is the case, the nature of the effect should be clearly indicated as well as an account of the steps taken in compliance with Section 2(b). (Procedures for compliance with the Executive Order are detailed in the Federal Register of January 25, 1974, "Procedures for the Protection of Historic and Cultural Properties," pp. 3366-3370.)

C. Under Section 1(3), Federal agencies are required to establish procedures regarding the preservation and enhancement of non-federally owned historic, architectural, and archeological properties in the execution of their plans and programs.

The environmental statement should contain a determination as to whether or not the proposed undertaking will contribute to the preservation and enhancement of non-federally owned districts, sites, buildings, structures and objects of historical, architectural or archeological significance.

III. Contact with the State Historic Preservation Officer.

The procedures for compliance with Section 106 of the National Historic Preservation Act of 1966 and Executive Order 11593 require the Federal agency to demonstrate consultation with the appropriate State Historic Preservation Officer. The State Historic Preservation Officer for Colorado is Stephen H. Hart. You may contact him c/o Cynthia Emrick, Preservation Assistant, State Historical Society of Colorado, Colorado State Museum, 200 14th Avenue, Denver, Colorado 80203.

Should you have any questions or require any additional assistance, please contact Brit Allan Storey of the Advisory Council staff at P. O. Box 25085, Denver, Colorado 80225, telephone number (303) 234-4946.

Sincerely yours,

John D. McDermott
Director, Office of Review
and Compliance

RESPONSE TO COMMENTS IN PRECEDING LETTER

General. The title of this document has apparently been misunderstood as reference is made to "the environmental statement for Master Plan Design Memorandum No. 13". All requirements regarding cultural resources at Trinidad Lake have been fully complied with and are reflected in the final environmental statement, on file with CEQ. The Master Plan does not discuss these subjects in as great detail as does the environmental statement, the primary instrument for ecological issues. It does however, respond to and incorporate measures surfaced in the environmental statement for preserving or enhancing project features (or project associated elements).

STATE OF COLORADO
John D. Vanderhoof, Governor
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE
R. Grieb, Director
6060 Broadway
Denver, Colorado 80216 (825-1192)

March 20, 1975

Mr. Jasper H. Coombes, P. E.
Chief, Engineering Division
Albuquerque District
Corps of Engineers
P. O. Box 1580
Alburquerque, New Mexico 87103

Dear Mr. Coombes:

The Colorado Division of Wildlife has reviewed the Draft Master Plan Design Memorandum No. 13 on the Trinidad Lake Project of January, 1975. Some project funds should be allocated for the development of a wildlife management area at the upper end of Trinidad Reservoir. The wildlife management plan and cost estimates are the responsibility of Mr. Carl Welsh, Regional Wildlife Manager, P. O. Box 7148, Colorado Springs, Colorado, 80933. Mr. Welsh will also be responsible for the fish stocking program which is contingent upon the establishment of a sufficient permanent pool of water.

The Division still advocates the retention of water in Model Reservoir to preserve the wildlife resource. However, we are unable to purchase water for storage and must rely on others to do this. Would the Corps of Engineers be willing to transfer some of their water rights to Model Reservoir?

We do have several specific comments on your draft report:

Pg. 6. Sect. B: Each natural resource and its managing agency should be defined.

Pg. 38: Rainbow trout is listed twice near the bottom of the page. Native or cutthroat trout are also found in these lakes.

DEPARTMENT OF NATURAL RESOURCES, T. W. Ten Eyck, Executive Director • WILDLIFE COMMISSION, R. W. Cool, Chairman
Charles A. Gebauer, Vice Chairman • Dr. J. K. Childress, Secretary • Dean Hull, Member • Ford Strong, Member
Dean Suttle, Member • Jean K. Tool, Member • Vernon C. Williams, Member

Pg. 39: The discussion on Model Reservoir should include the impact of the project on the wildlife resource.

Pg. 45. Table V: Hunting and wildlife oriented use should be included in this table because a few facilities will be needed on the wildlife management area.

Sincerely yours,

Jack R. Grieb,
Director

JRG:jb

cc: Harris Sherman
G. T. O'Malley
C. J. Kuiper
R. W. Thoesen
C. R. Welsh
Les Denton
J. P. Lewis

STATE OF COLORADO
Richard D. Lamm, Governor
DEPARTMENT OF NATURAL RESOURCES
Harris Sherman - Executive Director

DIVISION OF PARKS AND OUTDOOR RECREATION
1845 SHERMAN, DENVER, COLO. 80203
GEORGE T. O'MALLEY, JR., Director

PARKS AND OUTDOOR RECREATION BOARD:
Herbert I. Jones, Chairman
Marvin Elkins, Vice Chairman
Theodore R. Schubert, Secretary
Rowena Rogers, Member
Lyman W. Thomas, Member

March 14, 1975

Jasper H. Coombes, P.E.
Chief, Engineering Division
Department of the Army
Albuquerque District Corps of
Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Mr. Coombes:

We wish to thank you for sending us the Draft Master Plan of Trinidad to review for almost a month before the comments were due. This is a minimum to allow us time to review with the various sections of the division. Our comments are noted below. Some of these concerns and suggestions have been identified before and we would appreciate your thorough consideration of them. If they are infeasable for some reason, we would appreciate knowing the reasons the request wasn't included.

1. In the past (3-5-74 and 9-23-74) we have expressed concern regarding the Carpios Ridge Development ranging from suggestions on layout to providing for the exclusive use of the ridge for camping. In view of the difficult terrain and the economic constraints on the initial development, the layout as shown may have to suffice. We recommend that future expansion of Purgatoire Point be considered for the exclusive purpose of day use and that Carpios Ridge be exclusively camping. Keeping this in mind, the existing Carpios picnic area should be designed to be readily adaptable to camping.

2. Please size the sewage treatment ponds for future expansion.

3. Please refer to our letter of 9-23-74 regarding Washhouse and Comfort Station. We would like these suggestions included since from our experience they improve these facilities. In addition to the partial separation between showers and toilet area, we feel strongly that the laundry should be entirely separate from the toilets.
   a. Unlike showers, there is no need for laundry facilities to be separated into a men's room and a women's room.
   b. Separation assumes that in a campground, laundry functions are performed equally by men and women. This assumption is incorrect and in fact if the number of laundry facilities are determined based on the size of campground, the separation would probably only serve slightly over $\frac{1}{2}$ of the needs.

4. We suggest the clearing line be moved below 6200' since during the recreation season, 50% of the time the water is 30' below 6200' creating "a rather barren strip nearly a quarter of a mile wide". (p. 14)

5. We are pleased that the overlook facility at the Trinidad Recreation Site has been converted to a use-fee area through alignment of access past the contact station. For overlook purposes though, we question the value of this at all since as indicated in the plan the view is rather bleak and the cost ($30,000 or more) is rather high. It may serve as a picnic - day use site but if costs get tight, it could be eliminated from initial development.

6. Since the launch/parking area will be heavily used, we recommend that flush toilets be provided immediately. (p. 49)

7. There are more imaginative play structures now available that we prefer as compared to steel swings and slides. (p. 51 and 69)

8. We recommend colored concrete picnic pads. Also, please eliminate the solid concrete tables as an alternate. We feel that wooden seats and table top with concrete supports is far perferable. (p. 52)

9. Where are the "tepee rings" located? We would like more information on this. (p. 56)

10. On Plate 6, we recommend that boat parking be terracced starting at elevation 6190 so that parking alternate to the boat ramp (12% slope) is available. Also, we are concerned about the 2 "Y" intersections south of the entrance and believe this should be redesigned with the parking lot. Instead of making the entire existing parking lot into a 12% ramp, consider just using the approach road.

11. We recommend that parking areas should be designed (<u>and built</u>) to <u>blend</u> with the landscape and not be squared off (plates 6 and 7) as would be done in an urban area.

12. We appreciate having the serious matter of the coliform count pointed out (p. 31) but rather than leaving the solution indefinite (p. 43) we believe it is the function of this plan to investigate further, recommend solutions and incorporate the solutions into the construction cost to ensure that this area will be suitable for water sports. Swimming is not "at one's own risk" in Colorado if it is designated and managed.

13. It is the intent of the Division of Parks to provide a maintenance building at Carpios Ridge unless another site or existing building is available.

14. Please include colored concrete high-use pads, sunken trash barrels, drinking fountains suitable for handicapped use, larger group fireplaces, etc. as requested in our letter of 9-23-74.

15. We are enclosing a copy of our sign manual for your reference and incorporation in cost estimates and construction.

16. We have suggested in the past using grills on a stand, but recent experience has proven them to be unsatisfactory. Therefore we recommend ground-level grills.

Since your budget is limited in the initial phase and inflation will further affect the extent of facilities that can be provided, we suggest that a careful analysis of priorities would help ensure that the recreation area is useable immediately upon opening. In light of this, we feel that the basics - vehicle access, water access, sanitation, and vehicle controls - should be top priority. If any of our suggestions seem to surpass the available funds, a thorough analysis of <u>all</u> items should be undertaken to identify whether a facility is needed now or could be built later (such as overlook).

Sincerely,

George T. O'Malley, Jr.
Director

RGC:ljc

RESPONSE TO COMMENTS IN PRECEDING LETTER

Opening paragraph. We regret that a month was not sufficient time for review of the Master Plan and realize that additional time spent on a careful review will result in more constructive suggestions. As the Division has more than a casual interest in the project, continuous coordination, as has transpired between our agencies, will result in a project design that will most benefit the public.

Item 4. It is felt that the five-year pool is a reasonable level at which clearing should be accomplished. This elevation is below the irrigation pool level and, while this elevation may not be attained every year, only a very short period of inundation will kill all trees whose root systems are covered with water. These dead trees, perhaps covered with debris from a receding pool, will detract from the aesthetic quality of the lake and may have to be removed sooner or later. Also, these trees are safety hazards to boats when high pool levels are experienced.

Item 5. Plans for inclusion of the Trinidad overlook in the fee area have been altered to the original concept of having a free use area for the public. It is the Corps point of view that at least one free area should be available to the public, and as an area that does not have a great number of special use facilities that require constant maintenance and supervision, the overlook would be most suitable. While subjective, the view from the overlook should be attractive and uniquely interesting.

Item 6. Flush toilets cannot be provided in this area since it is subject to inundation and would require a more complex sewage system (involving pumps) to convey waste to the treatment facility.

Item 7. Swings and slides are but a few of the playground facilities being considered. Current concepts are to provide a selection of play facilities that will be favored by the youngsters.

Richard D. Lamm
Governor

C. J. KUIPER
State Engineer

DIVISION OF WATER RESOURCES
Department of Natural Resources
300 Columbine Building
1845 Sherman Street
Denver, Colorado 80203

March 7, 1975

Mr. Jasper H. Coombes
Chief, Engineering Division
Corps of Engineers
Albuquerque District
P. O. Box 1580
Albuquerque, New Mexico 87103

Dear Sir:

This office concurs in the Draft Master Plan for the Trinidad Lake Project.

Operations which affect river flow quantity, including during construction, initial filling, and ultimate conditions, must meet the general requirements of applicable Colorado statutes, as well as the specific Water Rights decrees which have been adjudicated in the basin. If we can be of assistance in the interpretation of these requirements, please contact our office.

Very truly yours,

Jeris A. Danielson

Dr. Jeris A. Danielson
Deputy State Engineer

JAD/WWB:mvg

COLORADO DEPARTMENT OF HEALTH

4210 EAST 11TH AVENUE · DENVER, COLORADO 80220 · PHONE 388-6111

Edward G. Dreyfus, M.D., M.P.H., Executive Director

March 5, 1975

Jasper H. Coombes, P.E.
Chief, Engineering Division
Department of the Army
Albuquerque District Corps of Engineers
P.O. Box 1580
Albuquerque, NM 87103

Subject: DRAFT MASTER PLAN DESIGN MEMORANDUM NO. 13
Trinidad Lake Project--Purgatoire River, Colorado

Dear Mr. Coombes:

The Colorado Department of Health has reviewed the above referenced draft and offers the following comment.

This design memorandum is primarily a definition of land use and of structural needs for accommodation of public use. As such, the document provides adequate consideration for sewage collection and treatment generated as a result of recreational use of the project.

Thank you for the opportunity of reviewing this document.

Sincerely,

Robert D. Siek
Assistant Director of Health
Environmental Programs

RDS/pl

STATE DEPARTMENT OF HIGHWAYS

CHAS. E. SHUMATE • EXECUTIVE DIRECTOR

DIVISION OF HIGHWAYS
E. N. HAASE
CHIEF ENGINEER

STATE OF COLORADO

COLORADO STATE PATROL
COL. C. WAYNE KEITH,
CHIEF

4201 EAST ARKANSAS AVENUE • DENVER, COLORADO 80222 • (303) 757-9011

February 25, 1975

Department of the Army
Albuquerque District, Corps of Engineers
P.O. Box 1580
Albuquerque, New Mexico 87103

Dear Sirs:

Thank you for an opportunity to comment on your Draft Master Plan for the Trinidad Lake Project, Purgatoire River, Colorado. It does not appear that there will be any significant impacts on the State highways in the area other than the ones described. There is one correction which would be appropriate with regard to a road referred to in your document as State Highway 238. This route was dropped from the State Highway System in 1953 and should be referred to as "old" State Highway 238 or County Primary 41.

Very truly yours,

E. N. HAASE
Chief Engineer

By Harvey R. Atchison
Harvey R. Atchison
Staff Environmental Manager

HRA/tds
cc: Shumate-Haase-Cox-Capron
ERA File
CF
RF