Feasibility Report and
Environmental Impact Statement
February 1985

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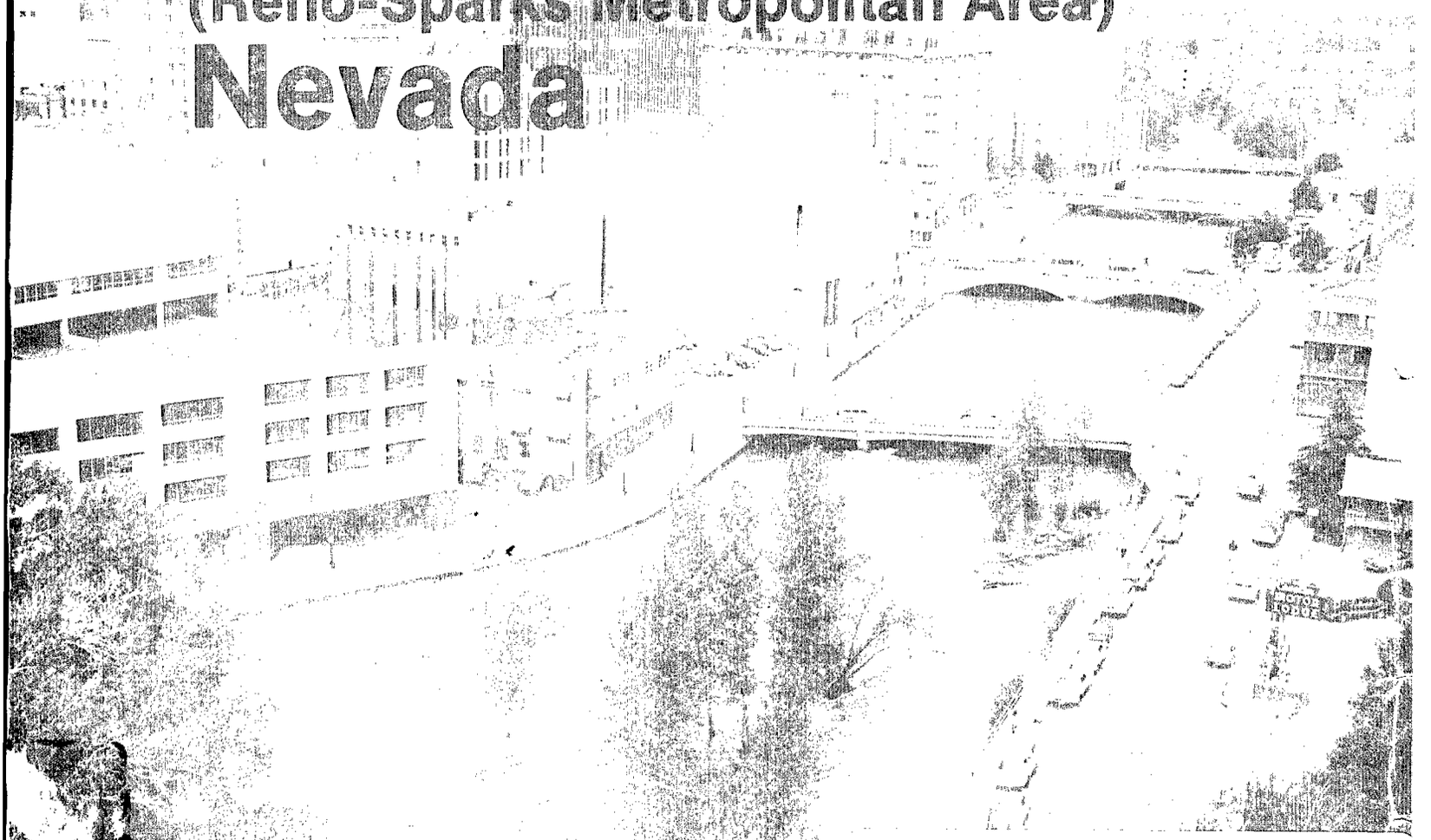
Truckee Meadows
(Reno-Sparks Metropolitan Area)
Nevada



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SUBJECT: Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada; Feasibility Report and Environmental Impact Statement

DA,South Pacific Division, Corps of Engineers,630Sansome St., Room 1216, San Francisco, CA 94111-2206 20 March 1985

TO: CDR USACE (DAEN-CWP)
WASH DC 20314

I concur with the conclusions and recommendations of the District Commander.

DONALD J. PALLADINO
Brigadier General, USA
Commanding

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SYLLABUS

The purpose of this study was to investigate water resource related problems in the Reno-Sparks Metropolitan Area and to determine the need for and feasibility of improvements to solve these problems.

The principal areas of concern included flood problems in the Reno-Sparks Truckee Meadows area, need for additional water based recreation, and the loss of fish and wildlife habitat. This study has developed a potential solution to these problems.

The plan selected as a result of this investigation would provide 100-year flood protection to the Reno-Sparks area, additional recreation opportunities, and improvements to fish and wildlife resources in the study area. The flood control features include approximately 5 miles of floodwalls, 7 miles of levees, and the replacement of 6 bridges along the Truckee River. Channel excavation is required near Booth Street, Wingfield Island and Glendale Park. Also to mitigate for a potential increase in downstream flood damages from the flood control measure, a 900-acre detention basin and backwater levees along Steamboat Creek and Boynton Slough would be constructed. Backwater levees would also extend along North Truckee Drain to just north of the I-80 crossing. Recreation facilities include a mix of multi-purpose day use facilities, bike paths, pedestrian paths, river overlooks, picnic sites, and a marsh nature area. Fish and wildlife mitigation measures include 31 acres of riparian plantings along the Truckee River and Steamboat Creek. Also, fish and wildlife enhancement measures have been developed that consist of 10 acres of riparian plantings, 300 acre marsh habitat preservation, and fish habitat improvements. These enhancement measures contribute to two Federal programs: the Migratory Bird Conservation Act and the Endangered Species Act. However, due to the lack of a sponsor for these features, the enhancement measures are not included in the recommended plan.

It is recommended that, subject to certain conditions of non-Federal cooperation as outlined in the report, the proposed plan of flood control, recreation, and fish and wildlife mitigation be authorized for construction. Estimated first and annual costs of the project are $74,720,000 and $6,628,000. With average annual benefits of $12,112,000, the project has a benefit-cost ratio of 1.8 to 1. Estimated non-Federal first cost is $37,160,000 and the annual operation and maintenance cost is $290,000. These costs are based on traditional cost-sharing methods. Non-Federal interests may be expected to cost-share to at least this level; however, non-Federal interests may be expected to financially participate to a greater level as the Administration's cost-sharing policies are established.

Revised July 1985

TRUCKEE MEADOWS
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
FEASIBILITY REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT

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Revised July 1985

TRUCKEE MEADOWS
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
FEASIBILITY REPORT AND
ENVIRONMENTAL IMPACT STATEMENT
FEBRUARY 1985

CHAPTER I

THE STUDY AND REPORT

A. PURPOSE

This study was conducted by the Sacramento District, U.S. Army Corps of Engineers to determine the need for providing additional flood protection, enhancing recreation opportunities, and improving fish, wildlife, and scenic values in the Reno-Sparks Truckee Meadows area of Nevada.

B. FEDERAL AUTHORITY

This report was prepared as the final response to a Congressional resolution which authorized Federal investigation of water resource problems in the Reno-Sparks, Truckee Meadows Metropolitan area. The resolution adopted by the Senate Committee on Public Works on 7 February 1964 follows:

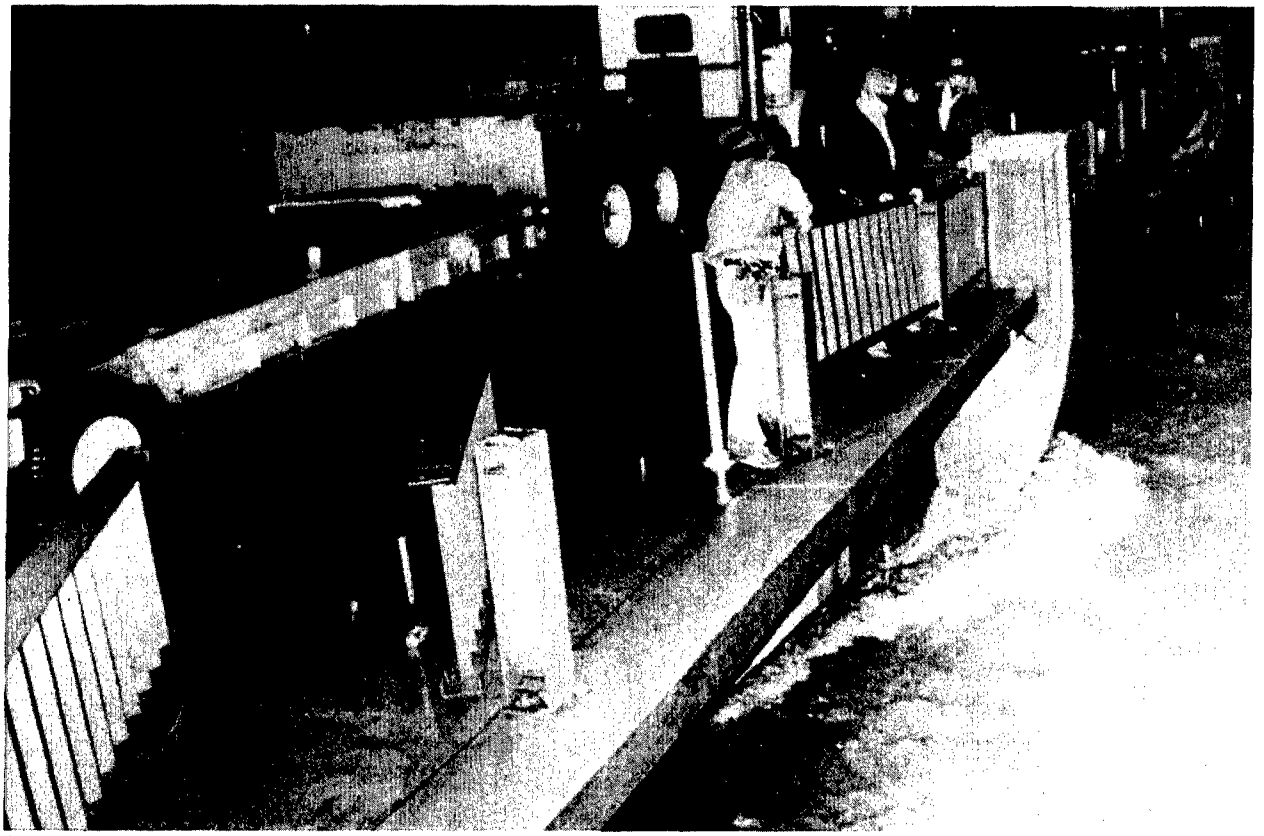
"Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on Truckee River and Tributaries, California and Nevada, published as House Document Number 497, 83rd Congress, and other pertinent reports, with a view to providing additional flood protection to the area known as Truckee Meadows, at and below Reno, Nevada."

C. SCOPE OF THE STUDY

The primary study area, shown on Plate 1, includes the Truckee River in Washoe and Storey Counties, Nevada, at and below Reno, Sparks, and the Truckee Meadows. The Truckee Meadows encompasses an area along the Truckee River from the central part of Reno on the west to the Virginia and Pah Pah Mountain Ranges on the east, south along Steamboat Creek to Huffaker Hills and includes Sparks to the north.

The Truckee Meadows area has been intensively studied by Federal, State, and local agencies. The numerous studies covered wide-ranging subjects including flood control, water quality and supply, fish and wildlife, and habitat evaluation and preservation. This investigation is limited to studies of flooding, water quality, recreation, and the preservation and enhancement of environmental values.

During this investigation many alternatives were developed to assist in solving these water resource problems. From these alternatives various plans were developed on the basis of support from local interests, environmental and social acceptability, and economic feasibility. Detailed studies of these plans were conducted and the most appropriate plan of improvement selected.



View of Lake Street Bridge in downtown Reno during December 1981 high flows. Railings are being removed to prevent accumulation of debris.

View of Virginia Street in downtown Reno during the December 1955 flood.

D. THE REPORT

This feasibility report discusses the investigation which was conducted to develop a selected plan of improvement. The report is arranged into two major segments: the main report and the Environmental Impact Statement (EIS). Attached to the EIS is an evaluation of the effects that placing fill in the Truckee River would have on water quality and wetlands. This evaluation is provided to meet requirements of Section 404(r) of the Clean Water Act (33 USC 1344). The Coordination Act Report of the U.S. Fish and Wildlife Service and the endangered species informal consultation response are also attached to the EIS.

E. HISTORY OF THE INVESTIGATION

The Truckee Meadows Investigation began in 1965 following a public meeting held in November 1964 to determine flood control improvements desired by local interests. Subsequent studies produced a tentative flood control plan consisting of storage facilities on the Truckee River at Verdi, interceptor facilities on Steamboat Creek, and channel improvements in Truckee Meadows. Local interests opposed the plan because it would have conflicted with proposed industrial development at Verdi. A later office study concerning Verdi Dam and Reservoir and other alternative reservoir sites did not receive State and local support. Therefore, the study was suspended in 1970.

In 1974, Washoe County asked the Corps to consider the economic feasibility of lowering the Vista reefs and channelizing the Truckee River. In 1975, the Corps determined that a channel enlargement alternative was feasible; hence, in late 1976 Washoe County and the cities of Reno and Sparks asked the Corps to resume the prior studies.

A reconnaissance report was prepared and approved by the Corps in September 1977, indicating that channel modification of the Truckee River between US 395 and Vista might be feasible. A vote of confidence was taken by the Washoe Council of Governments on 23 June 1978 urging the Corps to continue with its studies and concentrate on levee and channel plans.

F. STUDY PARTICIPANTS AND COORDINATION

Several agencies and groups at the Federal, State, and local level participated in this investigation. They include:

Federal:

Fish and Wildlife Service
Soil Conservation Service
Federal Emergency Management Agency
Department of Transportation
Federal Highway Administration
Geological Survey
Bureau of Reclamation
Forest Service

State

Nevada Department of Fish and Game
California Department of Fish and Game
Nevada State Highway Department
Nevada Division of Water Planning, State Engineer's Office
Nevada Division of Historic Preservation and Archeology
State of Nevada Civil Defense and Disaster Agency
University of Nevada, Reno
Nevada State Museum

Local:

Washoe Council of Governments
Regional Administrative Planning Agency
Washoe County Parks and Recreation Department
Washoe County, Public Works Department
City of Sparks, Public Works Department
City of Reno, Public Works Department
Reno City Engineer's Office
Truckee-Carson Water Conservation District
Lahontan Audubon Society
Tudor Engineering Company
Design Concepts West
Omni-Means, Ltd.

These agencies and groups provided numerous studies, documents, and data on levees, recreation, economics, water quality, land values, surveys, and environmental values. The Fish and Wildlife Service conducted an independent study concerning the investigation and prepared a document on the effects of various alternatives regarding fish and wildlife values.

Various public involvement activities were conducted to insure that the study would be responsive to public views and preferences. Actively involved in coordination activities were other Federal, State, regional, and local governmental entities and officials; public and private organizations; and individuals. A public meeting held in Reno, Nevada, 30 March 1977, gave agencies and local interests an opportunity to express their views on possible flood control improvements, potential recreation developments, fish and wildlife resources, and related socioeconomic, ecological, and environmental problems and conditions in the study area. The study was also discussed at a public workshop sponsored by Washoe Council of Governments (WCOG) on 27 April 1978. A public meeting and workshop were held in July 1980 in Reno to present various flood control alternatives for the Truckee Meadows area. Since July 1980 periodic coordination meetings have been held with concerned agencies and local officials of Reno, Sparks, and Washoe County. A public meeting was held in Reno in January 1984 to present the selected plan of improvement.

G. PRIOR STUDIES AND REPORTS

The prior studies and reports summarized here were conducted and prepared by the Corps of Engineers and other agencies and are of primary importance to the Truckee Meadows Investigation.

The Corps of Engineers completed an office report in June 1966 entitled "Truckee Meadows Investigation, Nevada, Truckee River Basin, Flood Damages and Flood Control Benefits." It summarized flood damage estimates and potential flood control benefits for the Truckee River below the Verdi damsite.

"Truckee River and Tributaries, California and Nevada, Truckee Meadows Investigation, Nevada, Proposed Plan of Improvement," January 1967, summarized the results of Corps studies made up to that time in response to the United States Senate Resolution dated 7 February 1964.

The Corps completed the office study "Truckee Meadows Investigation, Nevada, Alternative Storage Site," dated May 1968 which summarized the results of a reconnaissance of possible reservoir sites on the Truckee River and tributaries above Reno.

In October 1970, the Corps prepared a Flood Plain Information Report "Truckee River, Reno-Sparks-Truckee Meadows, Nevada," to provide for further study and planning for optimum development of flood plain areas commensurate with the flood hazard.

"Truckee River Reservoirs, Nevada and California, Master Report on Reservoir Regulation for Flood Control," dated December 1971, was prepared by the Corps of Engineers. It described each of four reservoirs located on tributaries to Truckee River. The report discussed objectives, methods of operation, and accomplishments of each of the reservoirs: Martis Creek Lake, Prosser Creek, Stampede, and Boca.

At the request of the Regional Planning Commission of Reno, Sparks, and Washoe County, the Sacramento District prepared two additional Flood Plain Information reports "Steamboat Creek and Tributaries, Steamboat and Pleasant Valley, Nevada," June 1972, and "Southwest Foothills Streams (Evans, Thomas, and Whites Creeks and Skyline Wash), Reno, Nevada," June 1974. The June 1972 report was used to identify flood hazards and future flood damages. The June 1974 report contained information indicating the approximate extent and depth of inundation from floods that can be reasonably expected to occur. These Flood Plain Information reports provided the city and county a basis of study and planning for optimum use and development of flood prone areas.

An office study "Truckee River and Tributaries, California and Nevada, Truckee Meadows Investigation, Nevada Channel Improvement Alternative," October 1975, presented results of the Corps preliminary plan of improvement including cost estimates.

"Environmental Inventory, Truckee Meadows, California and Nevada," prepared by the Corps, April 1977, provided environmental base data on species of flora and fauna in the Meadows.

In July 1977, a "Plan of Study" was prepared by the Corps. The study presented preliminary information on the problems of the area, possible alternatives, socioeconomic and environmental effects of the plans, and an evaluation of possible impacts.

Some of the recent water resource studies completed by other agencies include the following:

Fish and Wildlife Service completed studies for reestablishment of the spawning runs of the Lahontan cutthroat trout and the cui-ui sucker in the Truckee River.

Three water resource reports were completed March 1977, March-April 1977, and September 1978 by the Department of Agriculture, the Environmental Protection Agency, and the State of Nevada Department of Conservation and Natural Resources, respectively.

In 1977, 1978, 1979 and 1983, several water quality reports were prepared by the Washoe Council of Governments under the authority of Section 208 of the Federal Water Pollution Control Act Amendments of 1972 for Reno and vicinity.

H. COMPLETED WATER RESOURCES PROJECTS

Existing flood control and conservation projects in the Truckee Meadows area are summarized in Table 1, and can be located on Plate 1.

TABLE 1
COMPLETED WATER RESOURCES PROJECTS

PROJECT	AGENCY	COMPLETION DATE	PURPOSE
Newlands Project, including Lake Tahoe outlet control structure, Lahontan Reservoir (322,000 AC-FT) and accompanying powerplants, Derby Dam, Truckee Canal	Bureau of Reclamation	1915	Irrigation
Truckee River Storage Project, Boca Reservoir (40,800 AC-FT) irrigation distribution facilities	Bureau of Reclamation	1939	Irrigation
Truckee River Channel Improvements- 7.5 miles of widening, straightening, gradient steepening	Corps of Engineers	1963	Flood Control
Peavine Dam Project (4 flood detention reservoirs total storage of 1,200 AC-FT)	Soil Conservation Service	1957	Flood Control
Washoe Project Prosser Creek Reservoir (30,000 AC-FT)	Bureau of Reclamation	1965	Irrigation/ Flood Control
Stampede Reservoir (225,000 AC-FT)		1970	Irrigation/ Flood Control
Martis Creek Reservoir (20,000 AC-FT)	Corps of Engineers	1972	Flood Control

View of Martis Creek Reservoir completed by the Corps of Engineers in 1972.

CHAPTER II

RESOURCES AND ECONOMY OF THE STUDY AREA

A. ENVIRONMENTAL SETTING AND NATURAL RESOURCES

1. Description and Topography of Area.

The Truckee River basin in eastern California and western Nevada encompasses an area of about 3,060 square miles. A general map of the Truckee River basin is shown on Plate 1. The drainage area upstream of Reno includes 1,067 square miles of mountainous terrain on the eastern slope of the Sierra Nevada, the crest of which forms the western boundary of the basin. Within this area, 506 square miles are tributary drainage to Lake Tahoe. The lake is bisected by the Nevada-California border and is drained by the Truckee River.

The Truckee River begins at the northwestern shore of Lake Tahoe, where flows are regulated by an outlet structure. The river flows from the lake in a northerly direction about 15 miles to the town of Truckee, California, and then turns northeasterly for about 40 miles to Reno, Nevada. Near Reno the river enters a vast meadow known as Truckee Meadows. Below Reno the river flows about 50 miles easterly and northerly to Pyramid Lake, a remnant of prehistoric Lake Lahontan.

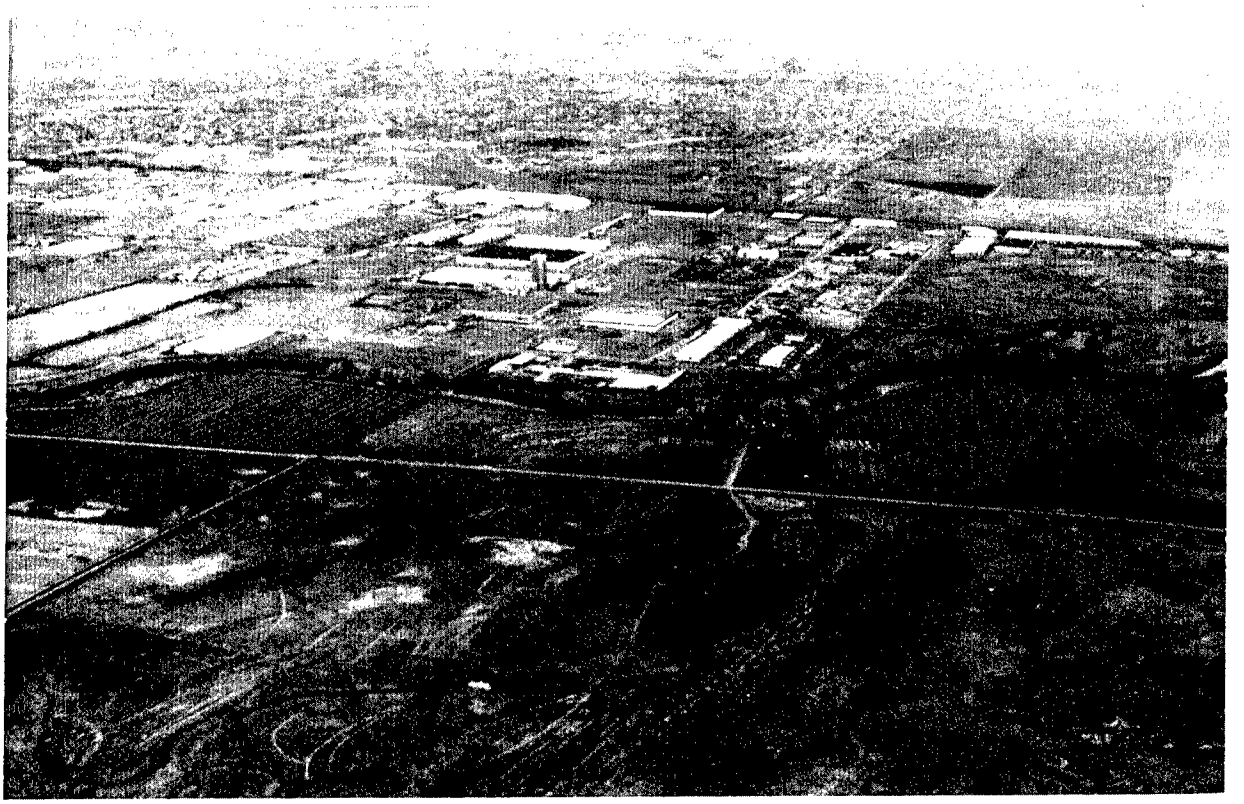
The upper portion of the Truckee River basin is located on the east flank of the Sierra Nevada Mountain Range. This terrain is characterized by rugged rocky peaks, precipitous cliffs, steep canyons, and occasional small meadows and lakes. The lower portion of the basin consists of scattered valleys and dry lakebeds separated by mountain ranges. Elevations within the basin range from 3,900 feet at Pyramid Lake to over 10,000 feet in the eastern Sierra Nevada, where most of the basin runoff originates.

The main tributaries below Lake Tahoe are the Little Truckee River, Squaw Creek, Prosser Creek, Donner Creek, Martis Creek, and Steamboat Creek. Riverflows originating above Reno are partially regulated by Lake Tahoe and Stampede, Boca, Prosser Creek, and Martis Creek Reservoirs. Steamboat Creek, the largest tributary in the Reno area, originates at the outlet of Washoe Lake, a large flat depression that receives any runoff originating upstream of it. The creek then drains the southern and eastern part of Truckee Meadows and enters the Truckee River near Vista. Evans, Dry, Thomas, Whites, and Galena Creeks are tributaries to Steamboat Creek and originate on the northeastern slopes of Mount Rose. Evans and Dry Creek combine below Highway 395 to form Boynton Slough.

Truckee Meadows, the low meadow area of about 10,000 acres located immediately east of the Reno-Sparks Metropolitian area, is at the bottom of a bowl-shaped area about 10 miles wide and 16 miles long between the Sierra Nevada Mountains on the west and the Virginia and Pah Pah Ranges on the east. The walls of the "bowl" rise sharply on all sides.

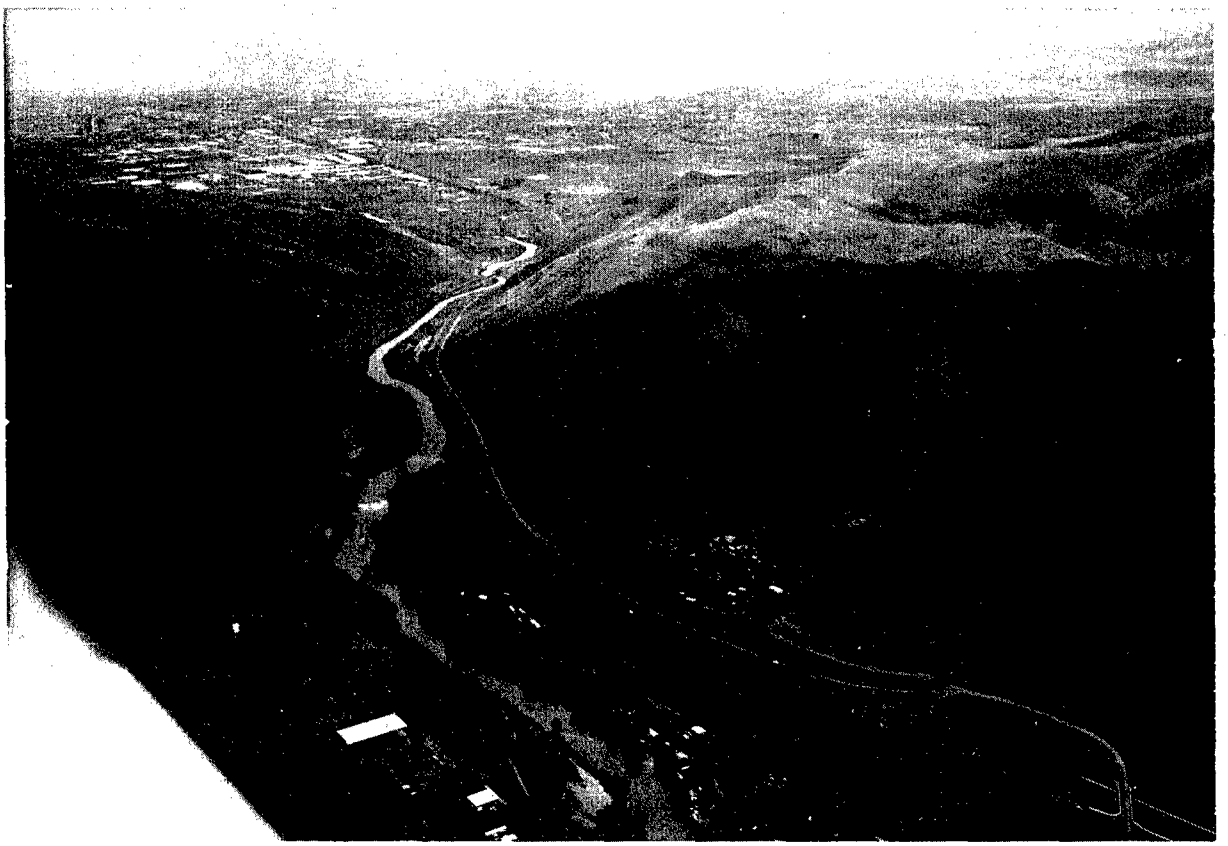
The cities of Reno and Sparks in Washoe County, Nevada, are located in the Truckee Meadows at an elevation of about 4,500 feet above sea level. Sparks is located north of the Truckee River immediately east of Reno in the Truckee Meadows. The topography is relatively flat, and much of the meadows becomes a flood plain for tributary streams. The flood plain is wide and expansive because a natural reef in the channel near Vista retards outflow of the Truckee River. Through the Meadows, the river slope is very slight, with little change in elevation for several miles. Downstream

View of the Truckee River through downtown Reno.

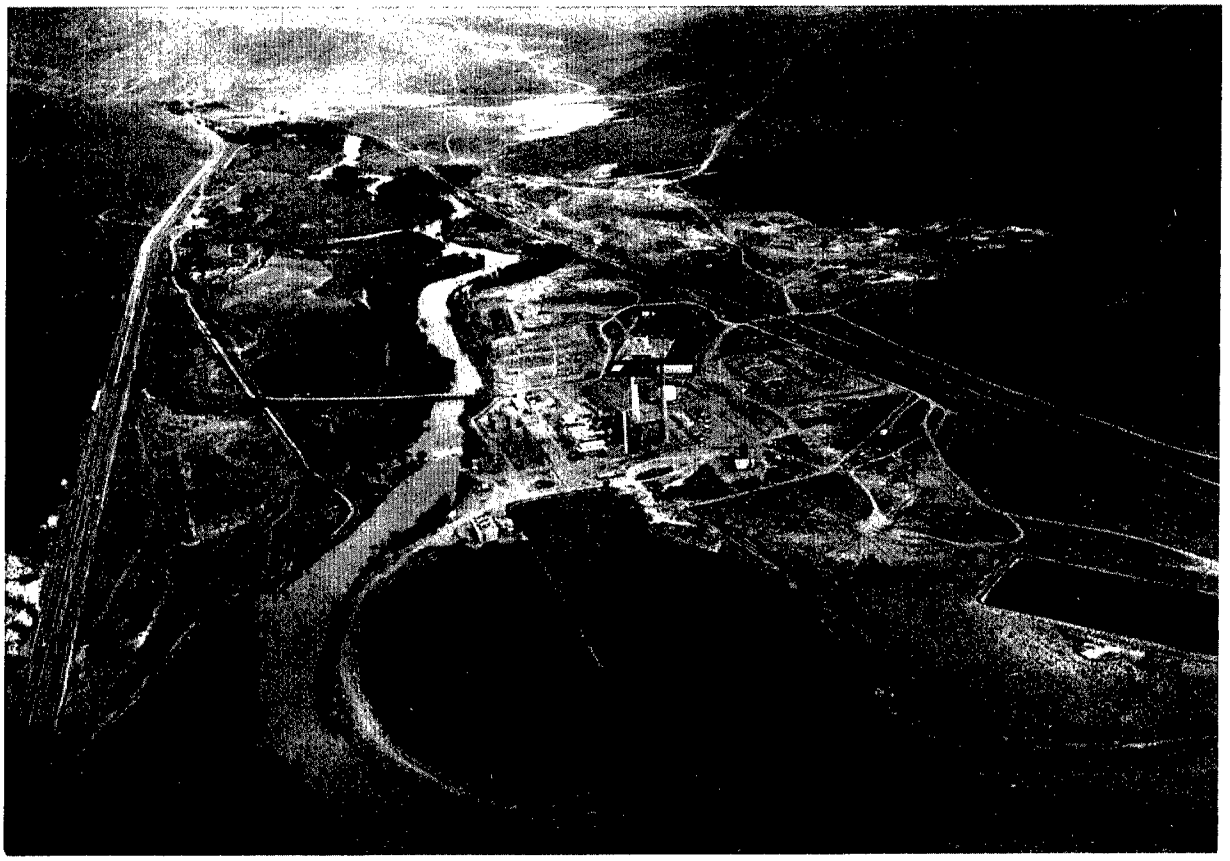


View of the Truckee River with Sparks in background.

View of the Truckee Meadows looking north towards Sparks. This particular area of the Meadows is a part of the University of Nevada Agricultural Experiment Station.



Vista reefs looking upstream along the Truckee River. Reno and Sparks are in the background.



Truckee River near Tracy Power Plant, approximately 15 river miles downstream of Vista.

Truckee River entering Pyramid Lake.

of the meadows, the Truckee River flows through a narrow canyon which in times of high flow acts as a dam with limited outflow potential. The river through this narrow canyon, often referred to as the Vista reefs, has been widened and deepened in the past. A considerable backwater effect occurs during high flow.

Reno and Sparks, along with their residential suburbs to the north and northwest (Sun Valley, Panther Valley, Golden Valley, and Lemmon Valley), and the unincorporated southern portion of the Truckee Meadows collectively comprise the Reno-Sparks Metropolitan area. A map of the Reno-Sparks Metropolitan area is shown on Plate 2.

2. Geology.

Reno is located on the western edge of the Great Basin in a transitional region between the Basin and Range province and the Sierra Nevada province. Truckee Meadows is a structural basin bounded on the west by the Carson Range, on the east by the Virginia Range, on the south by the Steamboat Hills, and on the north by the Peavine Mountain block.

The Mesozoic age metavolcanic and metasedimentary rocks of the Peavine sequence are overlain by a thick sequence of Tertiary volcanic and epiclastic rocks consisting of lava flows, breccias, and tuffs. Fluviatile and lacustrine sediments were the initial deposits consisting of conglomerate, siltstone, sandstone, and diatomite. These are exposed along the margins of Truckee Meadows. The three major categories of Quaternary deposits in the Truckee Meadows region, representing a long established pattern of basin sedimentation, consist of: (1) glacial outwash deposits and Truckee River gravels, (2) alluvial fan deposits around the perimeter of the basin, and (3) fine-grained flood plain and lake deposits throughout the central and eastern part of Truckee Meadows.

The geologic structure of the area was produced by faulting and warping. Quaternary faults that trend due north are common and widespread northward through Reno and in the Mount Rose fan complex northwest of Steamboat Hills. Nearly all the faults are normal faults. Displacement along these faults varies from a few feet to about 50 feet. Higher scarps are present along the west edge of Virginia Lake southward to the northwest side of Steamboat Hills. Another prominent set of faults trending north to northeast is concentrated in a 2-mile-wide zone located immediately northwest of the Truckee River in western Reno.

The Truckee River follows a winding eastward course through the Truckee River valley west of Reno and into the Truckee Meadows. The entire area is underlain by late Pleistocene Donner Lake and Tahoe glacial outwash deposits. The Donner Lake outwash deposit ranges from about 30 feet thick at the west end of the basin to over 330 feet thick eastward under Reno. This glacial deposition overlays the bedrock. The Tahoe glacial outwash deposit lies above the Donner Lake outwash. Similarly, the Tahoe outwash ranges in thickness from about 300 feet under west Reno to over 1,000 feet beneath Sparks. The Truckee River has reworked the top portion of the outwash and deposited the material along the modern flood plain of the river, overlying earlier glacial outwash. Both glacial outwash deposits contain boulders as large as 16 feet in diameter. Portions of the outwash are overlain by flood plain and lacustrine deposits. The flood plain materials are primarily

clayey silt, silt, and silty sand with interstitial lenses of either peat or clay-rich sediments.

3. Regional Seismicity and Faulting.

Two major fault systems are responsible for most of the seismic activities in western Nevada. The Sierra Nevada Frontal System is an irregular zone of major and secondary faults extending from the Garlock Fault northward along the east side of the Sierra Nevada Range for more than 400 miles. A second major zone, possibly related to the Frontal system, is the 118° Meridian Zone that trends southwest of Winnemucca to at least Owens Valley. Reno lies between these two major zones.

A prominent set of northeast-trending faults occurs in northwest and central Reno. One northeast-trending fault crosses the Truckee River north of the Cannon International Airport. Also, the east margin of Truckee Meadows is bounded by a fault. An obscured fault, with indications of fairly recent activity, may lie due north of the sewage facility. Areas underlain by glacial outwash and mainstream deposits of the Truckee River are believed to be potentially unstable and subject to slumps or ground disturbances along steep cuts or embankments during a major seismic event. Areas underlain by flood plain and lake deposits are subject to liquefaction, severe ground motion, and surface dislocation. This is especially dangerous in areas of ground water discharge or where the soils are saturated.

Historically, the most severe earthquakes in the area included those of magnitudes 6.0 and 6.4 just south of Reno in 1914. The first had an intensity of VII (Modified Mercalli Scale) in the Truckee Meadows area. It cracked buildings and had two distinct shocks lasting from 6 to 30 seconds. The second had an intensity of VIII in Reno. It lasted 10 seconds and toppled chimneys in the area. Two more earthquakes, both of magnitude 6.0, occurred near Virginia City in 1869 and near Verdi in 1948. And there was yet another earthquake of magnitude 5.7 north of Truckee in 1966. In all, from 1940 to 1970, approximately 70 earthquakes with magnitude 4.0 or greater occurred within 62 miles of Reno.

Research has found three to five separate movements on faults just north of Reno on the Mount Rose fan complex occurring within the last 11,000 years. A zone of recent micro-seismic activity is centered about 9 miles south of the Truckee River in the vicinity of Steamboat Hot Springs. For lack of evidence to the contrary, the faults cutting through the area must be considered to be capable faults.

4. Soils.

The soils of the immediate Truckee Meadows region are highly varied. Soil development on bedrock is relatively minor due to the arid climate, which is not favorable for deep chemical weathering. Soils in alluviated valleys are mainly granular, containing abundant sand, silt, and gravel. Soils adjacent to the river are dry with low organic content and generally consist of silts and clays with abundant gravel, and occur on variable slopes ranging from basin lowlands to steep mountain slopes. The soils are poorly to well-drained with low to moderate permeability. Erosion potential is low to moderate. The expansive quality (shrink-swell capacity) is moderate to very high. Soils farther from the river in the meadows are

generally composed of alluvium consisting of stream deposits. The soils are moist or wet with dark surface margins containing abundant organic matter. Slope is slight to moderate with good drainage. Permeability is low to rapid with low to moderately high erosion potential. The soil consists of clays, sands, and silts with occasional gravel. Clay soils have moderate to very high expansive quality (shrink-swell). Expansive soils are mostly highly plastic clays that undergo a significant volume increase with the addition of water. Clays of variable expansive qualities are present in many of the soils overlaying both alluvial deposits and bedrock.

5. Climate.

The upper part of the Truckee River basin is characterized by severe winters and short mild summers. Precipitation is markedly less than on the western slopes of the Sierra Nevada. The climate within the Truckee Meadows area is generally dry and semiarid. The temperatures are generally moderate with Reno and Verdi having a mean annual temperature of 49°F. Reno's temperature varies from a recorded maximum of about 104°F to a recorded minimum of -16°F. In the immediate vicinity of the Truckee River, temperatures are approximately 5-10°F cooler in summer and 5°F warmer in winter. Reno averages about 130 frost-free days per year. The temperatures in the Truckee Meadows area are mild. Nights are generally cool with the temperature rarely above 60°F. Humidity is low with a high incidence of sunshine, especially in summer.

Normal annual precipitation over the drainage area between Lake Tahoe and Vista varies from 8 to 70 inches, with a basin mean of 26.5 inches. Precipitation usually falls as snow above elevation 5,000 feet, but some storms produce rain up to the highest elevations of the basin, and snowfall may occur anywhere in the basin. The mean annual precipitation for Reno is 6.94 inches. Total snowfall for the city averages 25 inches per year but is seldom on the ground for more than 3 or 4 days. The majority of the precipitation falls from December to March. Winter precipitation is associated with climatic activity from the Pacific Ocean. The principal moisture source in summer is the northerly flow of air from the Gulf of California.

Relative humidity (RH) is moderate to low in summer (20 percent). The dry north and east winds can lower the RH to less than 10 percent, creating a critical forest fire threat. Humidity is very low in summer and moderately low in winter. Radiational-type fog occurs in the winter but is relatively rare, occurring in the lower portions of the study area.

6. Hydrology.

Most of the runoff from the Truckee River watershed is derived from the snowpack which accumulates over the high mountain areas during the winter and melts during the late spring and early summer. Because of the regulatory effects of Lake Tahoe, outflows into Truckee River are normally minor except during seasons of above-normal snowmelt runoff.

General storms which occur during the winter season of November through April originate over the Pacific Ocean and must cross the continuous barrier of the Sierra Nevada, which averages 8,000 feet in elevation. Precipitation in the headwater areas of the Truckee River basin associated with these storms is usually general snowfall over 1 to 4 days.

Local cloudbursts occur frequently in the summer, usually in July and August when warm, moist air is more likely to reach this area of Nevada from the Gulf of California. These storms are characterized by high intensities over small areas and can produce large floodflows on the smaller tributary streams but do not have a major impact on flows in the Truckee River.

Floods in the Truckee River basin can be divided into three distinct types: general rain floods, cloudburst floods, and snowmelt floods. General rain floods, which occur during the period of November through April, result from general rainstorms covering a large portion of the basin and are characterized by high peak flows and short durations (3 to 6 days). The total volume of runoff from such floods is relatively small.

Snowmelt floods result from the melting of the snowpack during the late spring and early summer (April through July) and have relatively large volumes and long durations. The distribution of runoff during the flood period is dependent upon the ripeness of the snow and the variation in air temperatures, with the highest rates of flow generally occurring in May and June. Snowmelt floods are essentially nondamaging in the Truckee Meadows area under existing conditions of upstream regulation.

Cloudburst floods are characterized by very high peak flows of short duration and low volume. These floods occur during the summer, can carry large amounts of debris and sediment, and can cause considerable damage on the smaller tributaries.

Additional information on flooding within the project area can be found in Chapter III, "Problems and Opportunities."

7. Ground Water.

The ground water resources of the basin are closely related to the surface water resources in that recharge of the ground water supply comes mostly from surface water. Some ground water recharge occurs directly from infiltrated precipitation. Except for the Pyramid Lake Valley, the Truckee Meadows area is the major ground water basin in the Truckee River drainage. An estimated 450,000 acre-feet of ground water is present within 100 feet of the surface in the Truckee Meadows.

The depth of the water table adjacent to the Truckee River through Reno and Sparks is around 20 feet based on drilling data from foundation reports for construction throughout Reno. Ground water depths vary considerably from about 4-1/2 to 20 feet in the western portion of the project area to around 6 to 12 feet in Truckee Meadows.

8. Water Supply.

The Truckee Meadows area depends primarily on the Truckee River for its water needs. Ground water also supplies about 15 percent of the water needs.

Water rights in Nevada are based on the doctrine of prior appropriation; i.e., the one who is first to divert water from a stream preempts a right to the quantity withdrawn provided that it is put to a beneficial use. Sierra Pacific Power Company owns a portion of the water rights along the Truckee River and provides water service to the greater Truckee Meadows area.

9. Water Quality.

a. Truckee River. - In 1978, the U.S. Environmental Protection Agency approved the 208 Areawide Water Quality Management Plan for the Truckee River Basin in Nevada. In 1979 and 1980, the Nevada Environmental Commission adopted new Water Pollution Control Regulations.

Water quality in the Truckee River generally diminishes as one moves downstream, due primarily to residential, municipal, agricultural, and industrial uses.

River temperature tends to increase as one moves downstream. Major temperature increases occur in the Truckee Meadows area, below the Reno-Sparks Waste Water Treatment Facility (WWTF), and in the lower reaches below Derby Dam. During the summer, violations of State temperature standards can occur downstream of Reno.

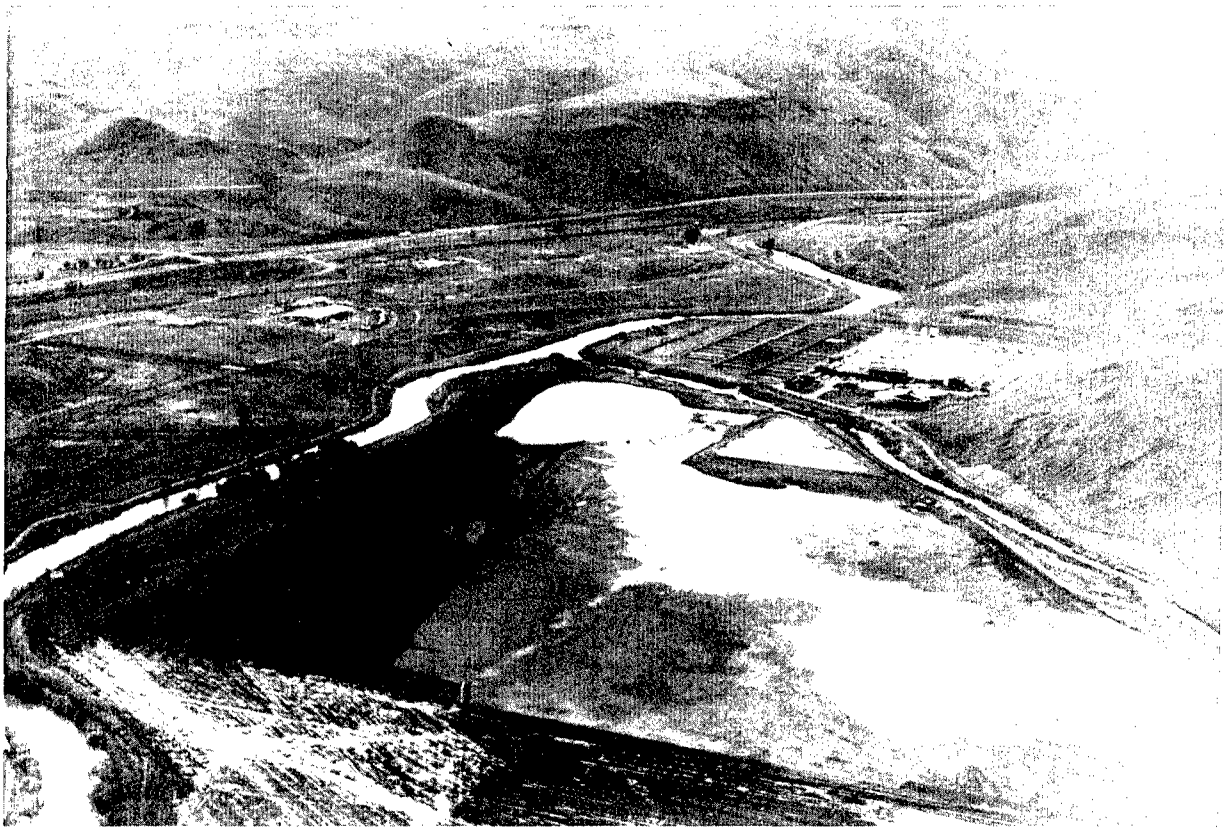
Concentrations of biochemical oxygen demand (BOD) are relatively constant along the Truckee River and average values are below the State standards. The major source of BOD is the WWTF. Dissolved oxygen concentrations generally comply with State standards.

The total nitrogen concentration in the Truckee River above the confluence with Steamboat Creek is approximately 0.04. Marked increases in total nitrogen and its various species are observed downstream from Steamboat Creek due primarily to the discharge from the Reno-Sparks WWTF.

Data which illustrate the spatial variations of total phosphate concentrations in the river show that the State standard has been exceeded at all points in the river, particularly below Boynton Lane. The major contributor is the Reno-Sparks WWTF (Reno City Profile 1981-1982).

Total dissolved solid (TDS) concentrations in the Truckee River exceed the State standard in the reaches just downstream of Reno and Sparks. The major contributors of TDS are Steamboat Creek, the North Truckee Drain, and the Reno-Sparks WWTF. The State standard for chlorides has been exceeded on occasion at virtually all points in the stream. Chloride concentrations generally increase progressively downstream of Reno and Sparks. Major contributors of chlorides are Steamboat Creek, the North Truckee Drain, and the Reno-Sparks WWTF effluent.

Concentrations of heavy metals in the Truckee River are relatively low. Substantial increases are noted below Vista, in comparison with the concentrations found at Farad, for arsenic, barium, copper, iron, manganese, mercury, and sulfate. Much of the increase can be attributed to the highly mineralized waters issuing from the Steamboat Hot Springs.



View of the Reno-Sparks Waste Water Treatment Facility located immediately below the Steamboat Creek and Truckee River confluence.

View of Steamboat Creek looking northwest. Sparks is in the background.

The pH of the Truckee River normally meets the State standards, ranging from 7.5 to 8.0 in most studies. Only the single-value standard has been exceeded, and then only in the lower reaches of the river, particularly at the Nixon Station at river mile 14.

Concentrations of fecal coliform in the river are generally below the State standard of 400 organisms per 100 ml. Observed values normally range from 0 to 300 per 100 ml. The sodium absorption ratio (SAR) is low, indicating the suitability of the river water for irrigation.

b. Steamboat Creek, North Truckee Drain, and Urban Storm Drain Data. - The dissolved oxygen, pH, BOD, and nitrates remain fairly constant along Steamboat Creek, whereas an increase in phosphates, temperature, flow, and coliform is noted in the reach immediately above the confluence with the Truckee River. This is due primarily to the discharge from the Reno-Sparks WWTF. It is apparent that the WWTF's effluent tends to increase temperature, nitrate, and phosphate concentrations of Steamboat Creek, and to decrease the pH. It is also apparent that the North Truckee Drain and Steamboat Creek above the discharge of the Reno-Sparks WWTF experience considerable change in quality between winter (January) and summer (August) with the summer quality considerably better.

10. Air Quality.

The Truckee Meadows Air Basin, emcompassing most of the Reno-Sparks area, (except for Stead, Spanish Springs Valley and Sun Valley to the north; Pleasant and Washoe Valleys to the south; and Verdi to the west) occasionally violates Federal air quality standards for carbon monoxide and particulates. Reno's air quality problem is exacerbated by topography, climate, and an inefficient transportation system. The air basin is small and experiences frequent temperature inversions, trapping pollutants.

The Reno area suffers from poor air quality depending on the season of the year and on the occurrence of a temperature inversion layer above the basin. The mountains that enclose the basin commonly trap the cold air at the valley floor and prevent its dispersal. Automobile emissions are a major factor in the pollutant load of the basin.

Inversions are especially important in the Truckee Meadows Air Basin as they trap pollutants close to the ground. Truckee Meadows experiences temperature inversions nearly every day. These inversions are responsible for the ground level haze visible most mornings. During a temperature inversion, the air near ground level becomes colder, more dense, and heavier than the air masses above. Vertical mixing is hindered. Without vertical mixing, pollutants disperse less readily and pollutant concentrations increase.

Afternoon breezes usually remove polluted air from the basin. A 20-mile-per-hour westerly wind can clean the Reno-Sparks area in a half hour. Serious and persistent inversions occur during the fall and winter months when the air masses are very stable and no winds are present.

During a severe winter temperature inversion, a brownish-grey blanket of pollution covers the Truckee Meadows area. But what cannot be seen is the most unhealthy pollutant of all. Carbon monoxide, an invisible, toxic gas that hinders the ability of the lungs to utilize oxygen, is the most serious Reno area air pollutant.

"Mobile sources" (an air quality term referring primarily to vehicular emissions) produce 95 percent of the total annual carbon monoxide emission in the Truckee Meadows Air Basin. On a winter day, however, this level declines to about 88 percent as traffic declines and woodburning increases. Wood stoves and fireplaces contribute about 40 percent of the carbon monoxide produced by stationary sources during the winter heating season.

Most of the visible pollutants on a smoggy day are particulates. They include smoke from auto emissions, fugitive dust from the ground and from construction sites, metallic particles, pulverized rubber from tires and dust from brake linings, and dust from construction sites. Fireplaces and wood stoves are the most significant source of airborne particulates in the Reno area.

Ozone, a pollutant gas formed by complex chemical reactions of other gases, is also of concern in the Reno area. Ozone concentrations peak in the summer; both intense sunlight and increased traffic emissions of nitrogen dioxide and unburned hydrocarbons contribute to ozone levels.

11. Waterways.

A cooperative effort by the Fish and Wildlife Service, Nevada Department of Wildlife, and the Environmental Protection Agency produced a fisheries evaluation of the streams of Nevada (1978 Stream Evaluation Map, State of Nevada).

The Truckee River and Streamboat Creek have been classified as follows:

Truckee River	
California State line to Confluence of Steamboat Creek	I (Highest-value fishery resource)
Confluence of Steamboat Creek to Derby Dam	II (High-priority fishery resource)
Derby Dam to Pyramid Lake	I (Highest-value fishery resource)
Steamboat Creek	
Little Washoe Lake to Boynton Slough	III (Substantial fishery resource)
Boynton Slough to Truckee River	IV (Limited fishery resource)

View of streamside vegetation along the Truckee River near Reno.

Vegetation in the Truckee Meadows includes desert shrubs, grasses, and sagebrush.

12. Vegetation.

Vegetation within the Truckee River basin is quite varied due to the wide range in elevation and climate. Native vegetation cover types are coniferous forest, pinyon-juniper woodland, chaparral, sagebrush, riparian, marsh, meadow, and greasewood.

The Truckee River region contains one of the principal areas of riparian growth in Nevada. A discontinuous ribbon of cottonwoods occurs along the river. Expanding fields and pastures by removing trees has reduced the width of the riparian habitat along the river. Grazing has tended to limit riparian growth. Much of the streamside vegetation was eliminated during the 1960's, when the Truckee River was channelized from Reno to Nixon.

In the Reno-Sparks area, ornamental species such as Lombardy poplar and elm have replaced indigenous vegetation. Stands of black cottonwood, western cottonwood, and willow are scattered in groves along the river. Vegetation includes desert shrubs, trees, grasses, and forbs. All or most of these plants can be termed phreatophytes - plants whose roots extend into the ground water and consume (transpire) large amounts of water. The major species include black greasewood, rubber rabbitbrush, western cottonwood, willow, and saltgrass.

In Truckee Meadows, the basic types of plant communities are the natural wetlands, irrigated and dry meadows, and the degraded sagebrush areas. The wetlands (marsh) are comprised of bulrush, cattail, spikerush, and pondweed. The irrigated areas include sedges, Baltic rush, and various grasses. The dry meadows generally have saline and/or alkali soils which support phreatophytic species such as fourwing saltbush, saltgrass, rabbitbrush, and greasewood. In the Truckee Meadows, the sagebrush communities have been replaced with annual weeds as a result of annual clearing to reduce fire hazards. The dominant species in the burned areas include Russian thistle, tumbleweed, and cheatgrass.

13. Fish.

The Truckee River supports approximately 28 species of fish. Twelve species are sought-after game fish of the study area. Two species have special status designations: the Lahontan cutthroat trout, which is classified threatened on the Federal list, and the cui-ui, which is classified endangered on both the Federal and Nevada lists.

The Truckee River in Nevada from the California State line through Reno is considered good trout water. The principal species of fish in this reach are rainbow trout, brown trout, brook trout, cutthroat trout, mountain whitefish, and mountain sucker.

Both the Nevada Department of Wildlife and California Department of Fish and Game plant the Truckee River and its tributaries. The average annual planting for the California portion is 88,700 pounds and for the Nevada portion is 25,000 pounds. The Nevada Department of Fish and Game operates a fish hatchery at Verdi which supplies Kokanee, Lahontan cutthroat, rainbow, brown, and brook trout to the streams and lakes of western Nevada. The hatchery was extensively expanded in the fall of 1976.

A major problem for the fishery downstream from Reno is the warm water temperatures. The temperature increase, as much as 10°F between Reno and Pyramid Lake, has been aggravated by loss of riparian vegetation which allows heating of the water by direct sunlight (Wolcott, personal communication). The Bureau of Reclamation releases 600-800 cfs out of Stampede Reservoir in an attempt to maintain lower temperatures in the summer. When water is available, this release has significantly reduced the temperature. Derby Dam, approximately 15 miles downstream from Reno, began diverting water for irrigation in 1906. The dam blocks upstream migration of trout and the cui-ui. In addition, this diversion and the others upstream have reduced the flow downstream of Derby Dam and ultimately into Pyramid Lake to approximately half of the 470,000 to 570,000 acre-feet per year which would have occurred under natural conditions. Pyramid Lake needs an annual inflow of at least 440,000 acre-feet to maintain a stable level; consequently, lake levels have been receding. However, runoff from the 1982-83 water year has substantially raised lake levels. A silt delta has formed at the mouth of the Truckee River which blocks historical upstream migration of the cutthroat and cui-ui in the natural river channel. The Fish and Wildlife Service has constructed the Pyramid Lake Fishway as a migration route to spawning areas upstream of the silt delta.

Ponds in the Truckee Meadows have been stocked with black crappie, yellow perch, large-month bass, and bluegill.

14. Wildlife.

A variety of wildlife species inhabit the riparian and other wetland habitats in the study area. The Truckee River and tributaries provide habitat for beaver, muskrat, and river otter. Steamboat Creek is one of only two locations where mink are found in Washoe County. Deer have utilized the Truckee Meadows near the lower end of Steamboat Creek. The meadows, marshes, and riparian areas provide habitat for small mammals such as the dusky shrew, western jumping mouse, and longtail vole. The small mammals provide most of the food for predators such as weasels and hawks. There are 16 species of bats within the study area.

Waterfowl, including Canada goose, mallard, pintail, teal, canvasback, and redhead, utilize the Truckee River corridor and lower Truckee River in sufficient numbers to support sporadic hunting. In addition, the wetland areas provide wintering, migrating, and resident habitat for approximately 18 species of shorebirds, including killdeer, spotted sandpiper, willet, Wilson's Phalarope, long-billed curlew, greater yellowlegs, least sandpiper, and snowy plover.

The close proximity of marsh, seasonally flooded meadow, and agricultural land produces significant rodent populations which make the Truckee Meadows attractive to the raptors. These include the barn owl, short-eared owl, marsh hawk, rough-legged hawk, ferruginous hawk, and American kestrel. The wetland areas are also excellent habitat for the black-crowned night heron, great blue heron, long-billed marsh wren, red-winged blackbirds, and sora and Virginia rails.

FWS lists four birds occurring in the Truckee Meadows which are "sensitive" species (those which could become Federally listed as threatened or endangered in the foreseeable future). They are the white pelican, Swainson's hawk, willow flycatcher, and loggerhead shrike.

Truckee Meadows provides wetland habitat for a number of waterfowl including the Canada Goose.

Mallards inhabit the Truckee Meadows in sufficient numbers to support sporadic hunting.

15. Threatened and Endangered Species.

The Fish and Wildlife Service in cooperation with the Bureau of Reclamation and Bureau of Indian Affairs has been working on a study to reestablish spawning runs of the threatened Lahontan cutthroat trout and the endangered cui-ui which occur in Pyramid Lake. The study includes determining the migration behavior and the extent and quality of available spawning and nursery areas. Lahontan cutthroat trout had naturally spawned in the Truckee River well up into California and in streams feeding Lake Tahoe, while the cui-ui spawned as far up as McCarran Ranch at Patrick. The principal reason for the decline of both species is that spawning habitat has been lost as a result of dams and diversions. Historically, these two fish were of great importance to the Paiute Indians as a source of food. In 1973, an active cui-ui propagation program was begun by the Pyramid Lake Paiute Tribe and the Fish and Wildlife Service. Since 1973, approximately 7.6 million fry have been released into the lower Truckee River and Pyramid Lake. Marble Bluff Dam and the associated Pyramid Lake Fishway were completed in 1975 and represent a major step towards restoration of the cui-ui. In January 1978 the Fish and Wildlife Service published the approved Cui-ui Recovery Plan; the primary objective of the plan is to restore the species to a nonendangered status. The purposes of the Cui-ui Recovery Team that prepared the plan include protecting the existing cui-ui, augmenting the present population by artificial culture, and protecting and restoring as much of the essential habitat as possible.

B. HUMAN RESOURCES

1. Archeology and Exploration.

Archeological evidence suggests that aboriginal habitation of the northern Sierra Nevada dates back at least 7,000 years. Originally, the native population subsisted by hunting large and small mammals and, secondarily, by seed gathering. From about AD 500, subsistence shifted from hunting to pinenut gathering and fishing. The Washoe Indians, inhabitants of the area, led a nomadic life. The lower elevation valleys in the eastern portion of the basin were the locations of their winter homes. In spring and summer they migrated to the upper portion of the basin where they hunted and fished. In the fall, they migrated back to lower elevations where they gathered pinenuts for their winter food supply. The abundant winter wildlife population and availability of other foodstuffs made the Truckee Meadows region an area of intense activity. The area was rich in basic resources - deer and antelope in the valleys; fish in the streams; pinyon pine groves in the nearby Virginia Range; and waterfowl in the marshes.

As early as 1825, Jedediah Smith led parties of trappers into the Truckee River basin, but the Stevens-Townsend-Murphy immigrant party, which crossed the Sierra Nevada at Donner Summit in 1844, provided the first documented visit to the area. The first recorded mention of the Truckee River occurred in the journals of John C. Fremont of the U.S. Army Topographical Corps, who crossed the river at present day Wadsworth in 1844.

Downtown Reno in the early 1920's.

The 1848 gold discovery in California made the Truckee River route increasingly popular. During the 1849 Gold Rush, thousands of people seeking their fortunes passed through the area on their way to California, and in the 1850's settlement began in Carson Valley and Truckee Meadows. Jamisons Station, east of Sparks, was the first permanent settlement of the region in 1852, and served as a Mormon trading station for emigrants to California.

In 1859, the discovery of gold and silver in the Comstock Lode in Nevada brought traffic from the west back through the area. Due to the increased traffic through the area, several inns and trading posts were established in Truckee Meadows and Truckee Canyon. Bridges constructed in the area include one near Verdi, one at the mouth of Hunter Creek, and one crossing within the present-day city limits of Reno called Lakes Crossing.

As the gold mines flourished, other industry such as lumber and wood, ice, and agriculture sprang up around the mining areas. The first farms had fruit, vegetables, wheat, oats, rye, barley, corn, potatoes, and hay. People passing through on their way to the goldfields traded with the farmers to replenish their food supplies. Ranching developed along with farming. Wild-rye grass was plentiful year-round for grazing in the area. Truckee, settled in 1859 by Joseph Grey, soon became the major center of activity for the distribution of products and supplies to mines in the area. Logging and lumbering became thriving industries.

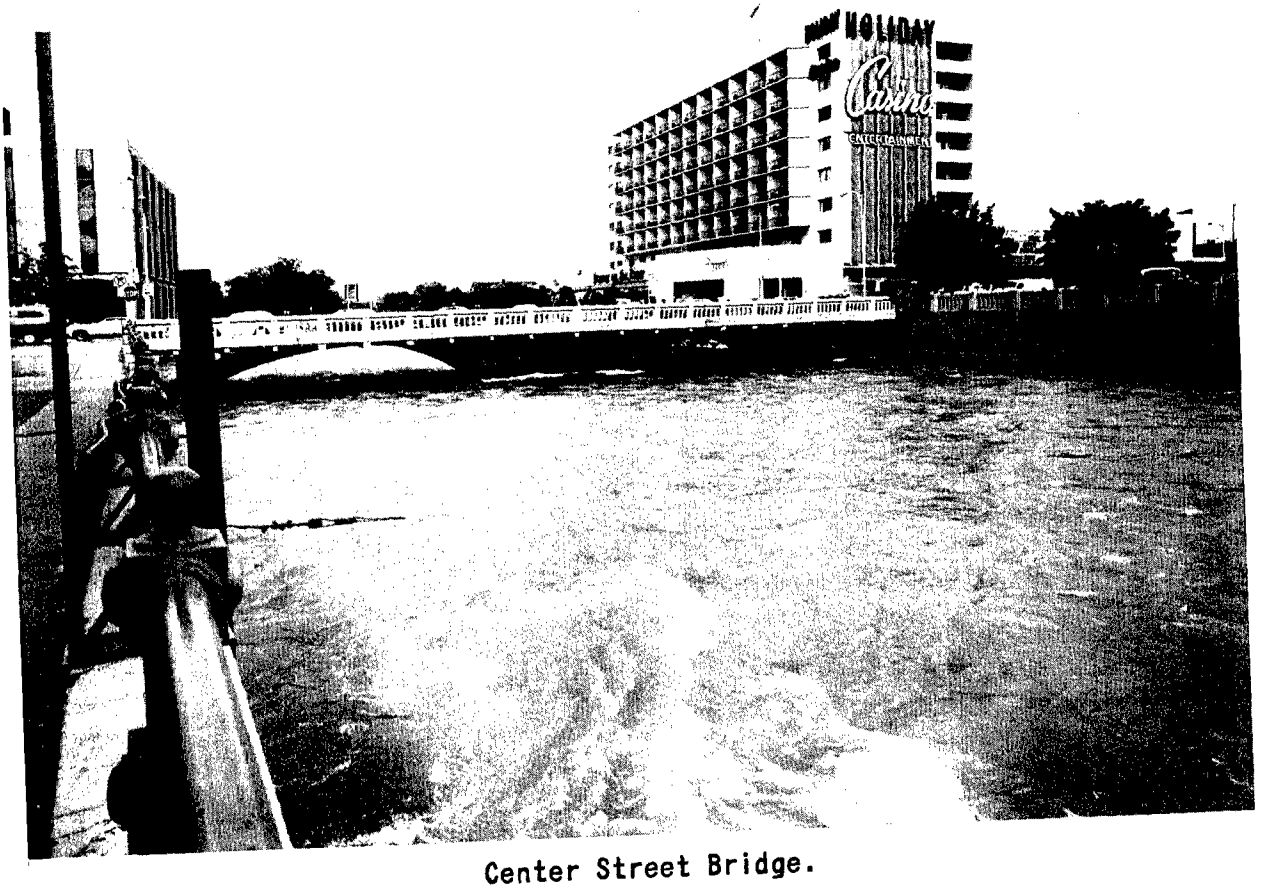
The Central Pacific Railroad linking California with eastern states was completed in 1868. The railroad passed over Donner Summit and through Truckee Canyon into Nevada. Regular stage and freight runs to and from Virginia City helped establish Reno as a railroad supply depot for the region. The railroad surveyed and auctioned off tracts of land in the Reno area for settlement. In 2 years the population of Reno had grown to over 1,000. The railroad was probably the most significant event leading to the early growth of the Truckee River basin. It provided a transcontinental route to import needed goods and materials as well as an outlet to various markets for goods produced.

The University of Nevada was established in 1886 in Reno. During the 1930's and 1940's, gambling developed into a major tourist industry.

Initial archeological investigations in the Truckee Meadows area were not conducted until the 1950's. Since that time, several specific studies have been undertaken, but no systematic surveying of the overall region has occurred. The most extensive field survey in the Truckee Meadows was conducted by Elston in 1967. Thirty-one prehistoric sites were recorded, of which six are within the present study area. The Arlington, Booth, Lake, Center, Virginia, and Sierra Street Bridges in downtown Reno have been recorded by the Nevada Historical Society. Of these, only the Virginia Street Bridge has been listed in the National Register of Historic Places.

2. Population.

The population of the Reno-Sparks Metropolitan area is predominantly white and concentrated in the 18 to 64 age bracket. As shown in Table 2, only 7.7 percent of the county's population was nonwhite compared to 12.5 percent statewide and 16.8 percent nationally. The nonwhite population is divided between blacks, American Indians, Asians, and all other races.



Center Street Bridge.

Virginia Street Bridge.

Lake Street Bridge.

Sierra Street Bridge.

TABLE 2

DEMOGRAPHIC CHARACTERISTICS OF WASHOE COUNTY, NEVADA, AND THE UNITED STATES - 1980

1980 Population	Washoe County	State of Nevada	United States
Number of persons	193,623	800,493	226,504,825
Percent nonwhite	7.7	12.5	16.8
Percent female	49.7	49.4	51.4
Percent under 18 years	23.9	27.0	28.0
Percent 18-64 years	67.6	64.8	60.7
Percent 65-over	8.5	8.2	11.3

SOURCE: U.S. Department of Commerce, Bureau of the Census, 1980 Census of the Population (Washington, D.C.: U.S. Government Printing Office).

TABLE 3

POPULATION GROWTH IN WASHOE COUNTY, NEVADA, AND THE UNITED STATES - 1950-1980

Year	Populations		
	Washoe County	State of Nevada	United States
1950	50,205	160,083	152,271,000
1955	65,200	220,200	165,931,000
1960	84,743	285,278	180,671,000
1965	103,420	386,466	194,303,000
1970	121,068	488,738	204,878,000
1980	193,623	800,493	226,505,000

SOURCE: U.S. Department of Commerce, Bureau of the Census.

Breaking down the population by age group reveals that Washoe County has fewer persons either under 18 or over 65 years old. An expanding economy attracts many migrants from other states who are seeking work in tourist-related or industrial businesses.

The most important aspect of the population in the Reno-Sparks area has been its phenomenal growth since World War II. From 1950 to 1980, Nevada was one of the fastest growing states in the nation, registering a population growth of 300 percent. Over the same period, Washoe County grew from 50,205 to 193,623 persons, an increase of 286 percent.

Table 3 shows the population growth in Washoe County, Nevada, and the United States from 1950 to 1980, when the last census was compiled. The population in the urbanized area of Reno and Sparks has increased from 121,068 in 1970 to 193,623 in 1980, an increase of nearly 60 percent. The growth in tourist and industrial businesses has caused an attraction to Reno and Sparks, resulting in a concentration of 70 percent of Washoe County's population in this area. Population projections are presented in Table 4.

3. Noise.

The primary source of noise in the Truckee Meadows is the Cannon International Airport. The proximity of the airport to urban development accentuates the problem. Residential developments in western Sparks and southern Reno, north and south of the airport, are affected most by airport noise. The airport is presently acquiring property most affected by noise; $44.5 million was earmarked for a land acquisition program. Trains and vehicular traffic cause additional noise.

4. Recreation.

a. General. - According to the State of Nevada's Statewide Comprehensive Outdoor Recreation Plan (SCORP), 1982, one of the most impressive aspects of Nevada outdoor recreation is its strong orientation to water resources. The Truckee River is one of the most beautiful open space and recreation assets in the Reno-Sparks area and provides a variety of recreation resources in a highly urbanized metropolitan area. This section describes the present use of all resource and the facilities that support its use.

b. Attendance. - No specific user origin data for the Truckee Meadows Investigation is available. However, data taken from a 1981 Nevada Department of Wildlife angler questionnaire survey show recreation user origin, which is presented in Table 5. An overwhelming majority of anglers (86 percent) originate from Washoe County. Approximately 60 percent of the anglers are estimated to have originated from the Reno-Sparks Metropolitan area, which represents 70 percent of Washoe County's population.

c. Existing Use. - The river and its resources support a variety of outdoor recreation activities such as fishing, swimming, rafting/tubing, bicycling, hiking, running/jogging and other exercise or fitness activities, picnicking, tennis, softball, and playground activities. The Truckee River is one of the most accessible and fished rivers in Nevada. It is among the top ten in popularity statewide. Nevada Department of Wildlife estimated there were over 125,000 angler days on the Truckee River (from Reno to

TABLE 4

POPULATION PROJECTIONS FOR SELECTED
COUNTIES AND CITIES FOR THE STATE OF NEVADA

Location	1982	1990	2000	2010	2020	2030	2040
Carson City	34,420	50,350	61,300	70,370	80,790	92,750	106,480
Churchill	15,460	19,300	20,840	23,940	27,480	31,550	36,220
Douglas	22,240	35,870	51,490	59,110	67,860	77,910	89,440
Lyon	15,570	21,270	25,900	29,730	34,140	39,190	44,990
Storey	1,680	2,270	2,760	3,170	3,640	4,180	4,790
Washoe	211,730	284,000	348,000	401,490	463,200	534,390	616,520
Reno	108,540	145,590	167,970	193,780	223,570	257,930	297,570
Sparks	43,250	58,010	66,930	77,210	89,080	102,770	118,570

SOURCES:
Population estimate for 1982 based on 1980 Census of Population and Housing, U.S. Department of Commerce, Bureau of the Census; Bureau of Business and Economic Research, College of Business Administration, University of Nevada, Reno.

1982-2000 based on Bureau of Business and Economic Research Population Forecasts, University of Nevada, Reno.

2000-2040 based on 1980 BEA Regional Projections, U.S. Department of Commerce, Bureau of Economic Analysis.

Idlewild Park in Reno along the Truckee River.

TABLE 5
1981 ANGLER ORIGIN - TRUCKEE RIVER

ANGLER RESIDENCE	ESTIMATED NUMBER OF ANGLERS
Carson City, NV	353
Churchill County, NV	74
Clark County, NV	229
Douglas County, NV	84
Elko County, NV	47
Humboldt County, NV	32
Lyon County, NV	93
Mineral County, NV	8
Nye County, NV	6
Pershing County, NV	24
Storey County, NV	16
Washoe County, NV	13,074
White Pine County, NV	26
Arizona	8
California	804
Idaho	7
Other	251
TOTAL	15,136

Stateline) in 1981. The number of angler days is projected to increase to 209,900 by 1985 and 227,200 by 1990. Sparks Recreation Department reports an average annual attendance along their Truckee River greenbelt of approximately 52,500 spectators and participants. Total recreation use along the river in the project area is estimated to be 1,800,000 recreation days annually.

SCORP identified recreation use in six "Outdoor Recreation Planning Regions" (ORPR). The Truckee Meadows area is located in ORPR 1 which is composed of Washoe County, Carson City, Douglas County, Lyon County, and Churchill County. Table 6 contains recreation use data extrapolated from SCORP. The table shows the top 15 outdoor recreation activities for Region 1. These data do not represent the number of users or recreation days of use since one person may participate in more than one activity in a day. The data do indicate relative importance of the activities.

d. Existing Public Recreation Facilities. - The existing public recreation facilities in the study area range from passive open space areas to more developed areas. The City of Reno has 17 parks and access sites along the Truckee River. The most extensive recreation area along the Truckee River is the City of Sparks' Truckee River Greenbelt - four access sites linked by 6 miles of pedestrian/bike paths. This greenbelt river corridor is an excellent example of recreation access along a river. The Truckee Meadows portion of the project area along Steamboat Creek contains the partially developed Mira Loma Park. Table 7 lists all the facilities, operating agencies, and total acres in the project area, and Figure 1 shows the locations.

e. Alternative Water-Oriented Recreation Areas. - SCORP's Planning Region 1 contains 98 rivers and streams totaling 914 miles, including the Carson, Walker, and Truckee Rivers. Of the 914 miles of rivers, the Truckee flows approximately 86 miles from Stateline to Pyramid Lake. Lakes and reservoirs supporting water-oriented recreation are shown on Table 8. Most of these areas provide picnic facilities in addition to the facilities listed. However, none of these water resources (excluding the Truckee River) provide urban water-oriented recreation facilities, such as riverwalks, pedestrian/bike paths, or developed parks, comparable to those on the Truckee River in the Reno-Sparks area.

5. Cultural Opportunities.

Cultural opportunities have expanded since formation of the Sierra Nevada Arts Foundation. Organized in 1971, the foundation serves as the headquarters for development and promotion of the arts. Cultural groups associated with the foundation include the Sierra Nevada Museum of Art and the Community Concert Association.

6. Education.

Washoe County is served by 42 elementary schools, 9 middle schools (grades 6 through 8), and 9 high schools under the jurisdiction of the Washoe County School District. Total student population is about 30,000. The University of Nevada, Reno, provides the major post-secondary educational opportunities.

TABLE 6
RECREATION ACTIVITY OCCASIONS - REGION I

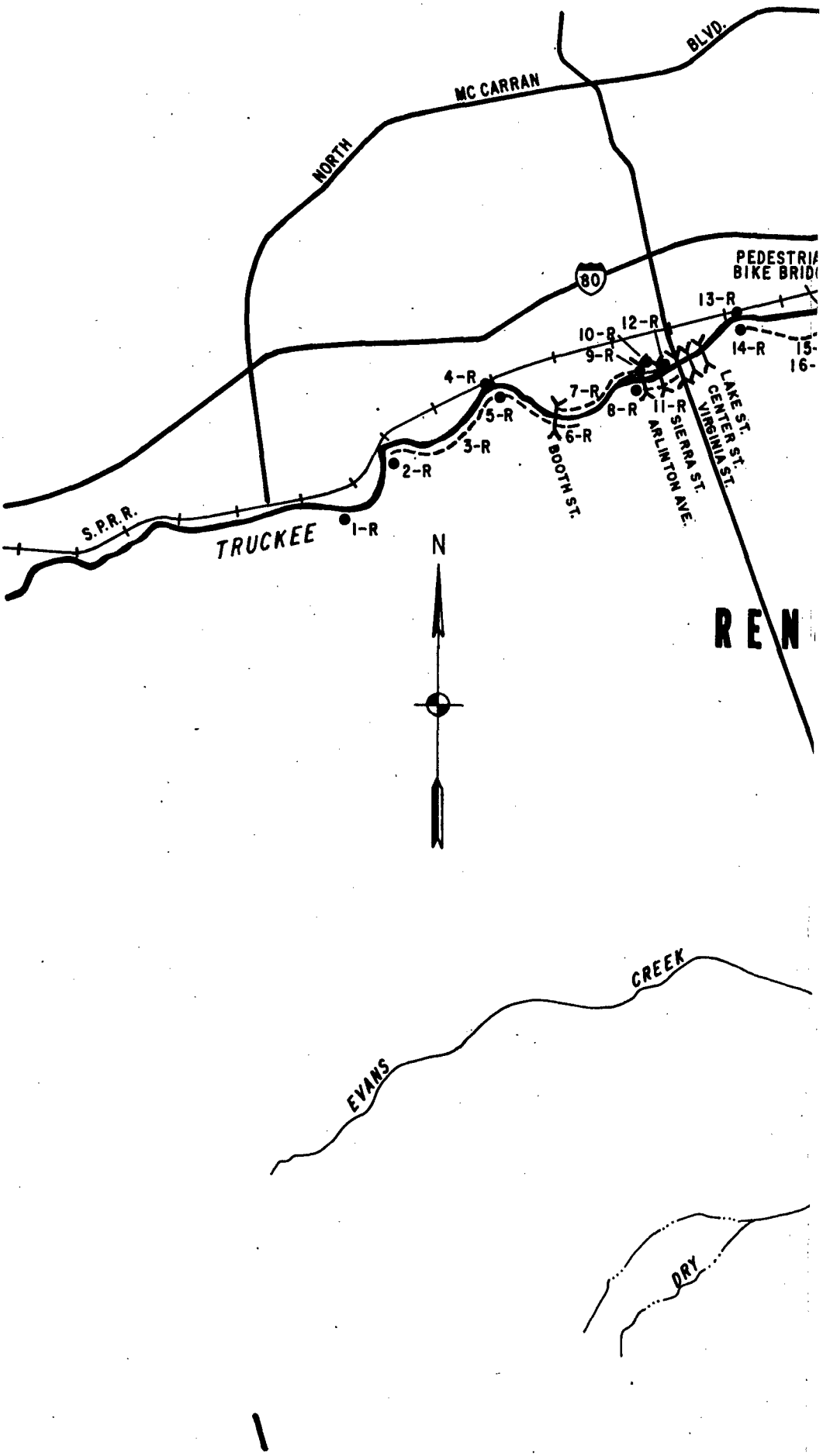
ACTIVITY	1980	2000
Pleasure Drive	5,684,853	9,438,564
Swimming	5,363,688	9,025,352
Relax Outdoors	4,373,639	7,726,307
Bicycling	2,596,563	4,699,500
Hiking	1,535,180	2,942,522
Gardening	1,185,237	2,072,386
Play Games	1,152,746	1,969,828
Picnicking	867,949	1,517,403
Motorboating	759,312	1,230,903
Tent Camping	658,020	1,077,504
Lake Fishing	629,500	1,056,530
Nature Study	626,668	1,064,567
Vehicle Camping	547,689	926,376
Stream Fishing	520,560	874,042
Downhill Skiing	499,945	823,205

SOURCE: Nevada Statewide Comprehensive Outdoor Recreation Plan, 1982.

TABLE 7
EXISTING PUBLIC RECREATION FACILITIES

Number 1/	Name	Approximate Area (acres)	Facilities
1-R	Chrissie Caughlin Park	10	Pathways, turf area, fishing platform (handicapped), par course
2-R	Ivan Sack Park	1	Turf area, picnic table
3-R	DeLoretto Walkway	Unknown	1/2 mile public walkway access
4-R	Dickerson Road Public Access	Unknown	Public access easement pathways to river
5-R	Idlewild Park	49	Playground area, kiddie rides, jogging paths, 2 lakes, outdoor swimming pool, turf areas, picnic tables, lighted softball fields, physical fitness center, restrooms
6-R	Water's Edge Walkway	1/4	Public walkway
7-R	Bicentennial Park and Riverbelt	3	Public access easement pathway
8-R	Riverside Park	3	4 tennis courts, playground, basketball court, restroom
9-R	Wingfield Park	3	Turf area, picnic sites
10-R	West Street Plaza	1/2	Downtown plaza area
11-R	Island Avenue Public Alley	Unknown	Public alley
12-R	Truckee River Lane Public Alley	Unknown	Public alley
13-R	Kuenzli Riverbelt Fishing Access	1/2	Public walkway, fishing access
14-R	William Brodhead Park	2	Turf area and pathways
15-R	Harrah's Walkway	Unknown	Public walkway, fishing access
16-R	Gazette Journal Walkway	Unknown	Public walkway, fishing access
17-R	Fisherman's Park	4	Trail, fishing access
18-S	Fisherman's Park	3.4	Picnic tables, fitness course, trail, restrooms
19-R	MGM Walkway	Unknown	Public river access, trail
20-S	Greg Street Gateway	.9	Turf area, path
21-S	Rock Park	7.5	Turf area, picnic tables (group shelter), fitness course, trail, horseshoe area
22-S	Glendale Park	4.3	Turf area, picnic tables, fitness course, trail, restrooms
23-S	Cottonwood Park	6.2	Turf area, picnic tables, children's play area, fitness course, trail, restrooms
24-R	Mira Loma Park (under construction)	39	Turf area, group picnic shelter, playfield, playground, multi-use path, restrooms

1/ R - Reno Department of Parks and Recreation
S - Sparks Recreation Department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NORTH
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PEDESTRIA
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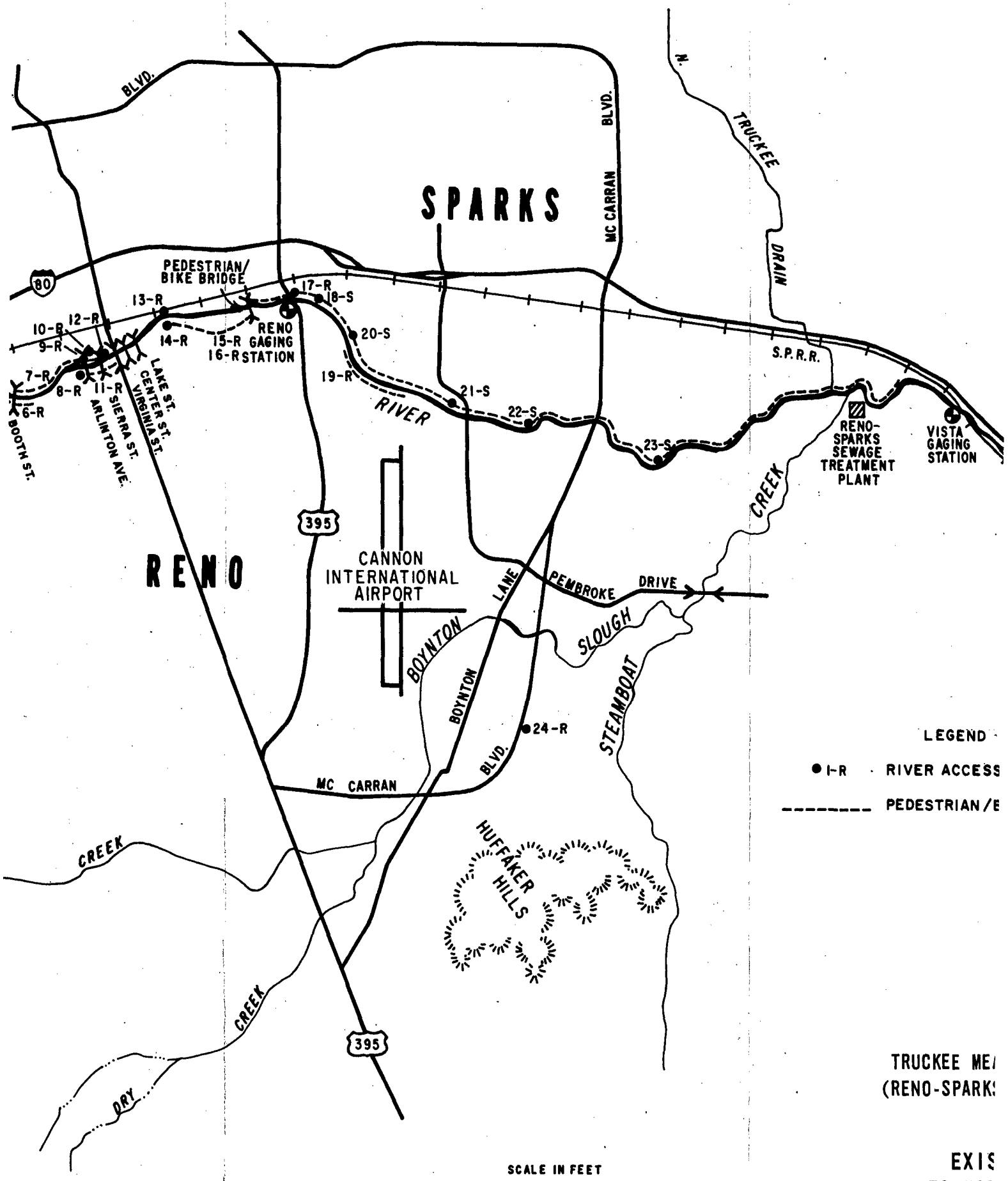

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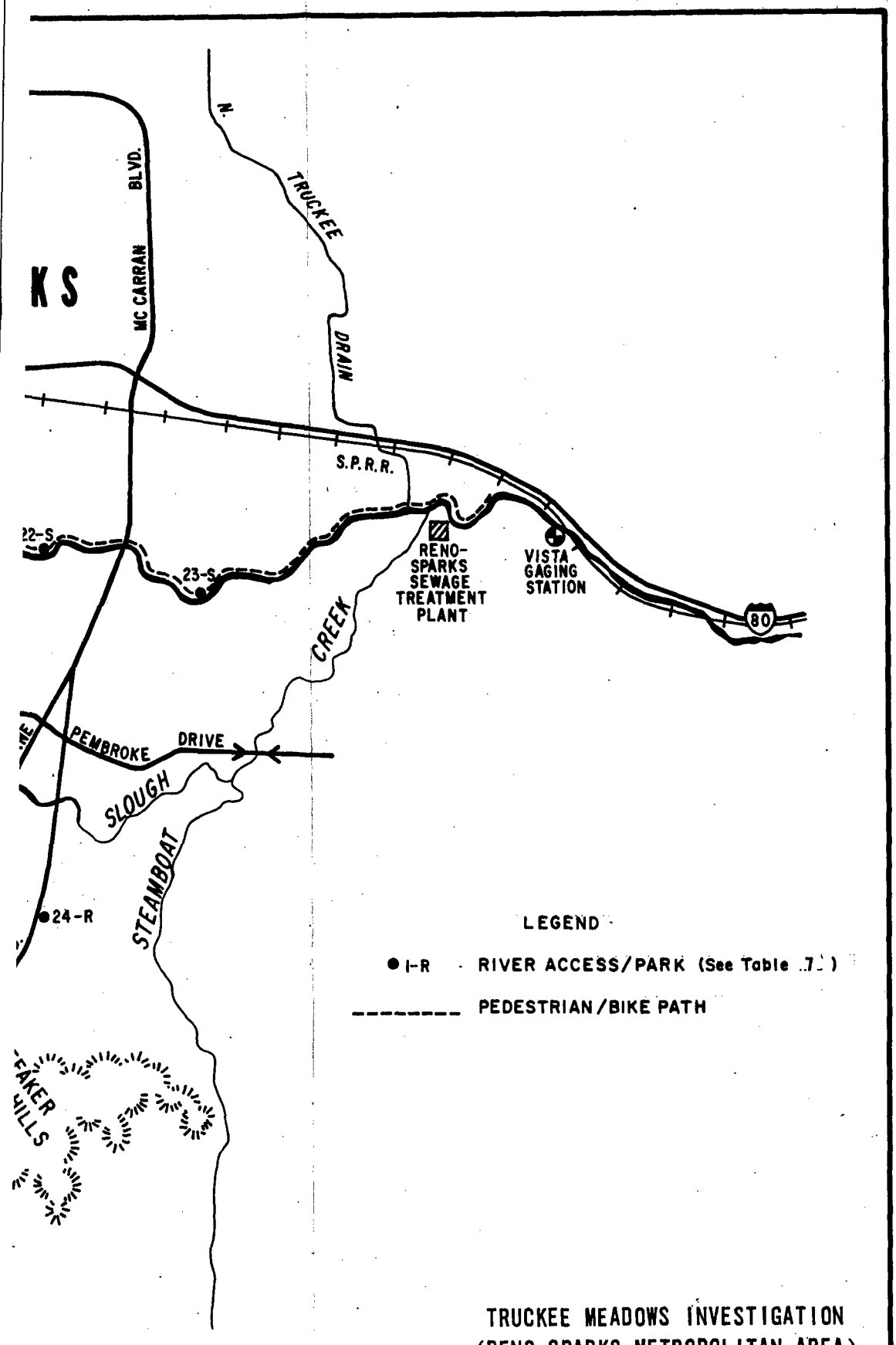


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

EXISTING PUBLIC
RECREATION FACILITIES

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 1

TABLE 8

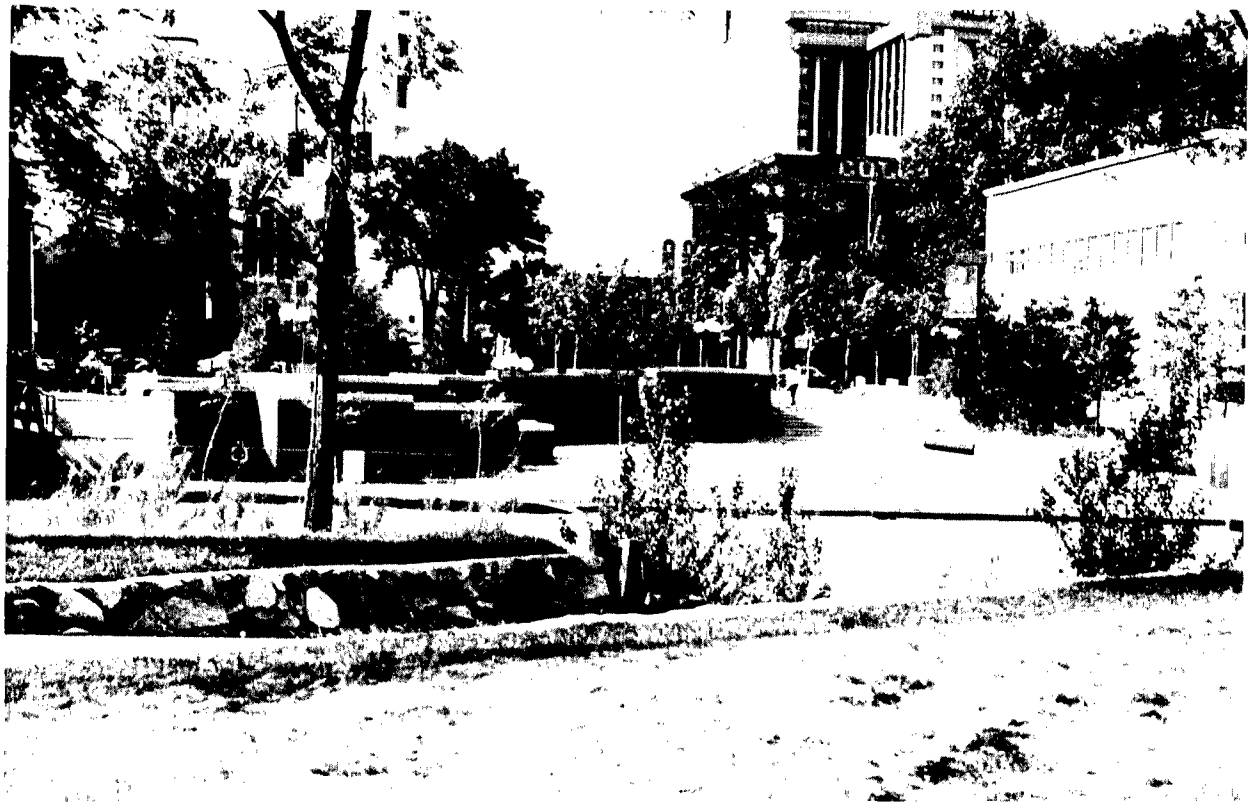
EXISTING LAKES AND RESERVOIRS SUPPORTING WATER-ORIENTED RECREATION - REGION I

LAKE/RESERVOIR	SURFACE ACRES	FISHING	WATERSKIING	MOTOR BOATING	NONMOTOR BOATING
Big Soda Lake	400		X	X	X
Ft. Churchill Cooling Ponds	200	X			
Indian Lakes	700	X			X
Harmon Reservoir	205	X		R	X
Lahontan	14,800	X	X	X	X
Paradise Lake	25	X		X	
Pyramid Lake	108,000	X	X	X	X
Sheckler Reservoir	1,000	X	X	X	X
Stillwater Point	1,900	X		X	X
Tahoe	36,400*	X	X	X	X
Topaz	1,250*	X	X	X	X
Tracy Pond	30	X			
Virginia Lake	24	X			
Washoe (Big and Little)	6,100	X	X	X	X
Subtotal (Acres)	171,034	170,634	167,950	170,000	170,755

*Acreages shown here are estimated areas on the Nevada side of state boundaries dividing these lakes.

R - Restrictions as to speed, size of motor, and areas (contact local agencies).

SOURCE: Nevada Statewide Comprehensive Outdoor Recreation Plan, 1982.



West Street Plaza located in downtown Reno provides a popular rest stop along the river.

Pedestrian/bike paths along the river provide excellent recreation for tourists and local residents.

Fishing is very popular along the Truckee River.

Rock Park along the Truckee River.

Reno Arch.

C. DEVELOPMENT AND ECONOMY

1. Government Finance.

Revenue for governmental needs within Washoe County is generated from general property taxes, State sales taxes, and direct levies on the gaming industry. Local government revenue comes from State sales tax and local property taxes. State government revenues come from the gaming taxes. In the State of Nevada, all general property taxes are collected by the county tax collectors and remitted to each participating local government according to imposed tax rate of the local government. The general property tax rate is expressed as a rate per $100 of assessed valuation. The amount of revenue collected from levies on gaming activities has increased steadily during the last 10 years due to new construction, high inflation, and increased tourism.

2. Personal Income.

Between 1970-1979, income levels as well as the overall economy in the area, grew rapidly. This is indicated by the average annual growth rates of 15.9 percent and 10.6 percent for total personal income and per capita personal income, respectively. As of 1979, the per capita personal income of approximately $12,300 in Washoe County was the highest level of income recorded of any other metropolitan area in the United States. In 1982, the per capita personal income was $13,740, showing a slowdown in the growth rate of 10.6% for the period 1970-1979, to 3.8% for the period 1979-1982. The level of income is no longer the highest in the nation, but still stands 23.8% above the U.S. National average of $11,100. The highest individual earnings were paid to workers in the construction, mining, transportation, communications, and public utility employment sectors.

3. Employment.

The distribution of employment in Washoe County by industry group reveals the heavy dependence of the local economy on tourist-related gaming activities. 39.2% of the working force was employed by service industries in 1982, of which a large percentage includes the gaming and hotel industry. The next largest sector of employment is that of wholesale and retail trade, employing 21.7%, followed by government occupations, making up 14.6% of the work force.

4. Business and Industrial Activities.

Business and industrial activity in the metropolitan area is heavily concentrated in tourism and gaming, with warehousing and associated light manufacturing a distant second. These two industries are the area's major "basic" or export industries, which generate earnings by providing goods and services to consumers residing outside the area. In addition, relatively minor contributions to the economic base are made by mining and agriculture, along with portions of transportation, utilities, trade, finance, and the Federal Government. Growth in the base sectors has considerably expanded the number of jobs in the area, leading to heavy influx of workers. The resulting growth has stimulated expansion of nonbasic industries providing goods and services to the local population.

High-rise bank building located on Virginia Street in downtown Reno.

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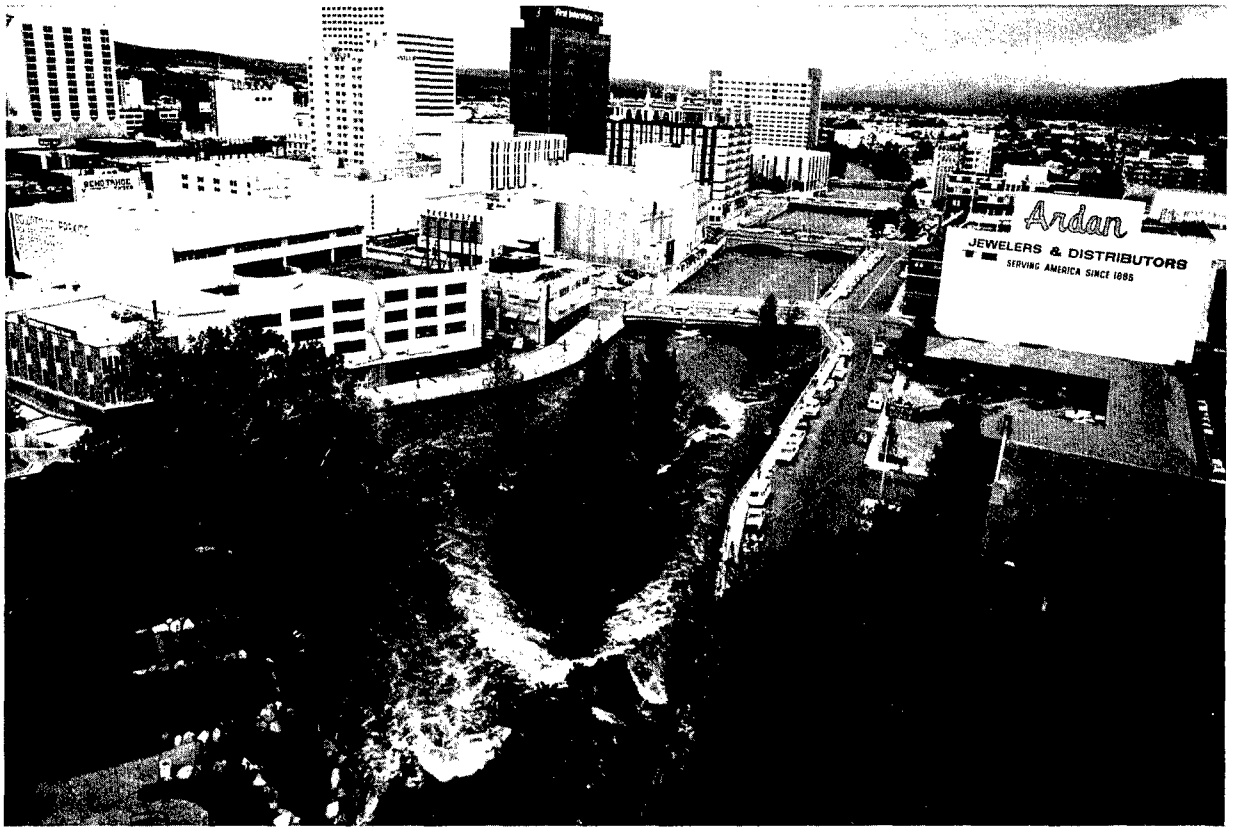
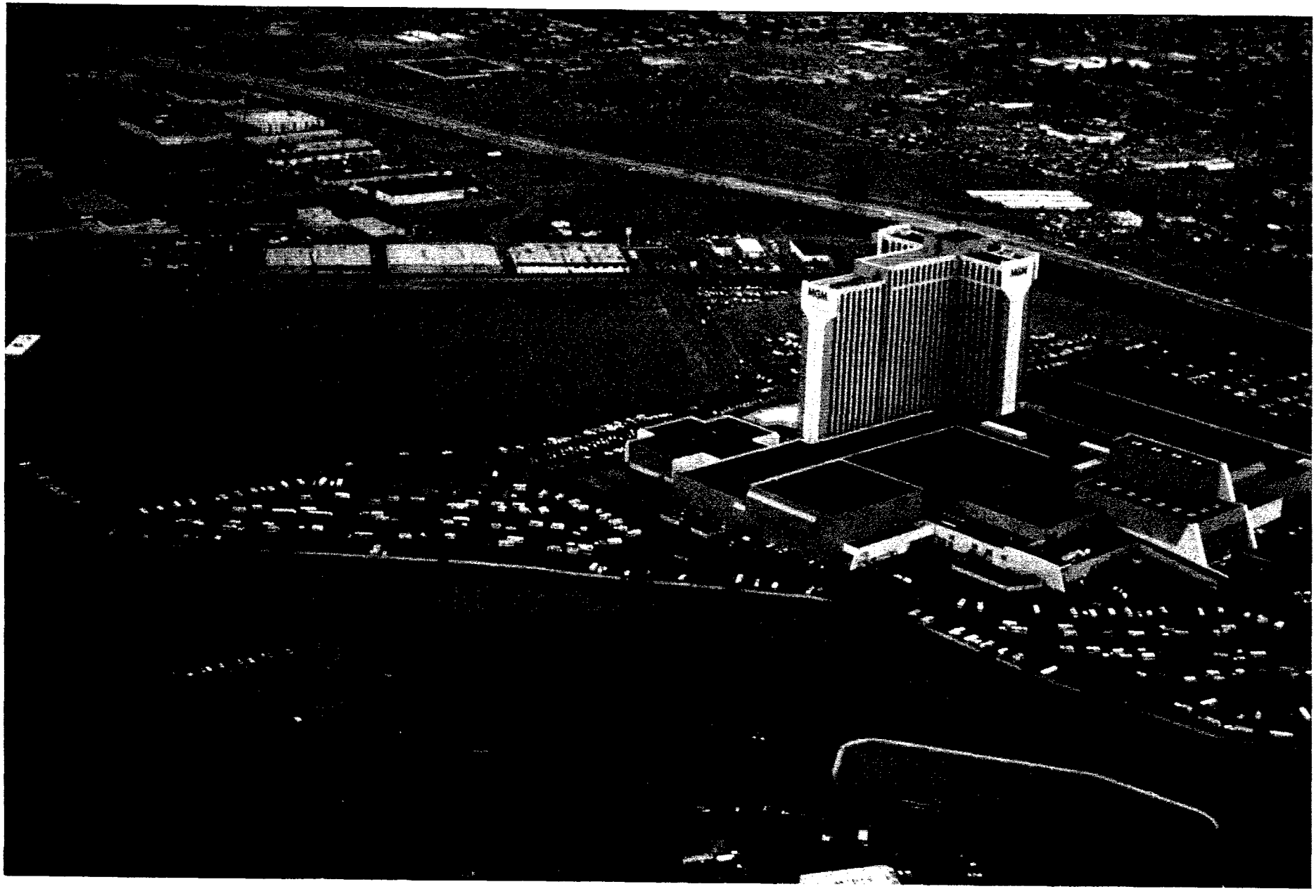
Irrigated cropland in the project area is being reduced due to urbanization.

▼

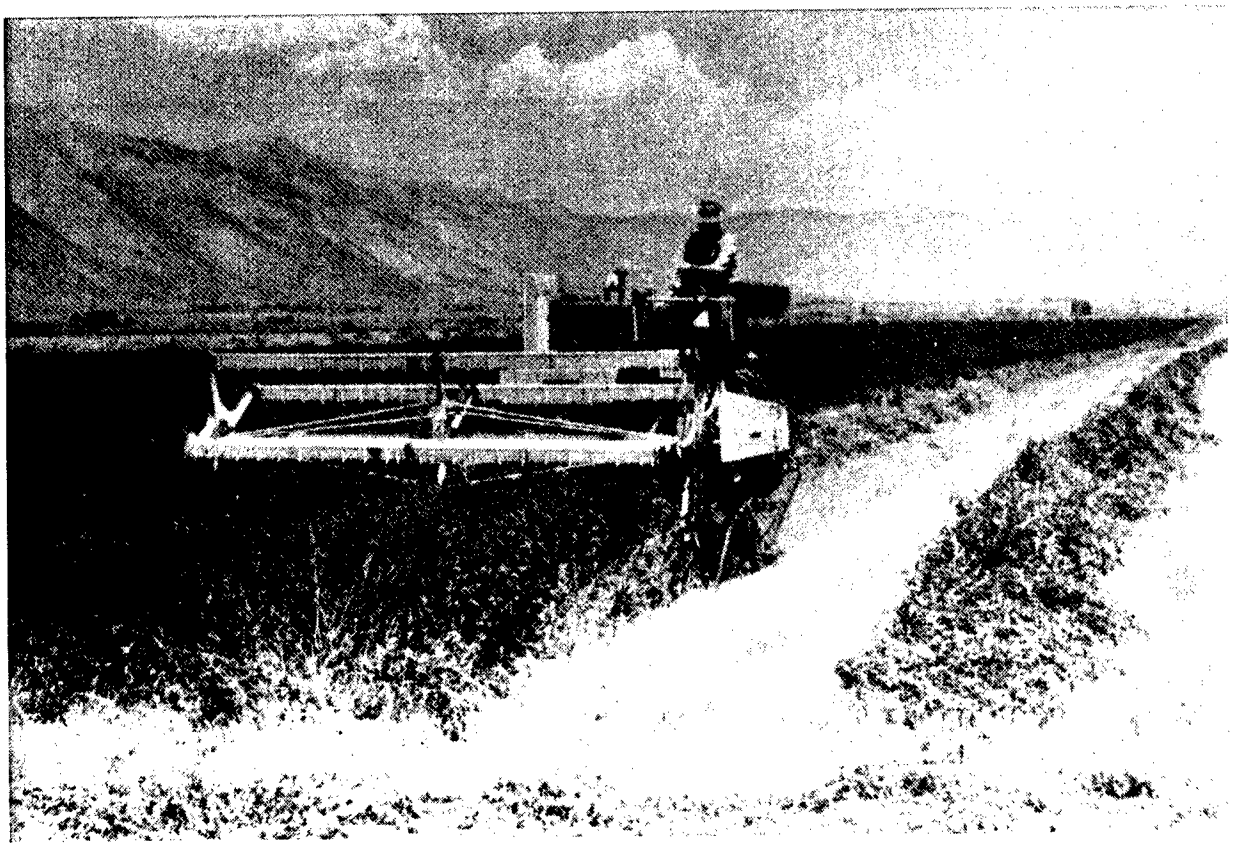
Casinos and tourist related businesses line Virginia Street in Reno.



Truckee River through downtown Reno showing dense development.



MGM Grand Casino and Hotel adjacent to Truckee River in Reno.



Agricultural activities within the Truckee Meadows area.

At present, the primary means by which the Reno-Sparks economy is diversified is through the warehousing industry. The high elevation and dry climate is ideal for warehousing, and the Reno area is centrally located for distribution to major west coast cities. Other factors which have traditionally fostered growth in warehousing are a stable labor supply, weak unions, and cooperative State and local governments.

The Nevada tax structure provided the initial impetus for growth of warehousing in the Meadows and maintains its strength. Nevada imposes no personal or corporate income taxes. Under the Freeport Law, which is the mainstay of growth in the warehousing section, goods in transit through the State are exempted from inventory taxes. Since the law also exempts from taxation goods being assembled or processed, a closely related light manufacturing industry has developed.

Agriculture in the Truckee River basin is still an important activity, although land under cultivation has been substantially reduced over the last few decades. The majority of this agricultural activity is concentrated in the Truckee Meadows south and east of Reno. Substantial farmlands also exist in level areas of the Truckee River canyon upstream of Reno and in the Spanish Springs Valley north of Sparks. The major agricultural activities in the area are grazing cattle and growing alfalfa hay.

It is expected that with continued growth of urban areas, farming will decline further. Most of the loss will occur east of Sparks and south of Reno along Route 395, where rapid development is now occurring.

5. Land Use.

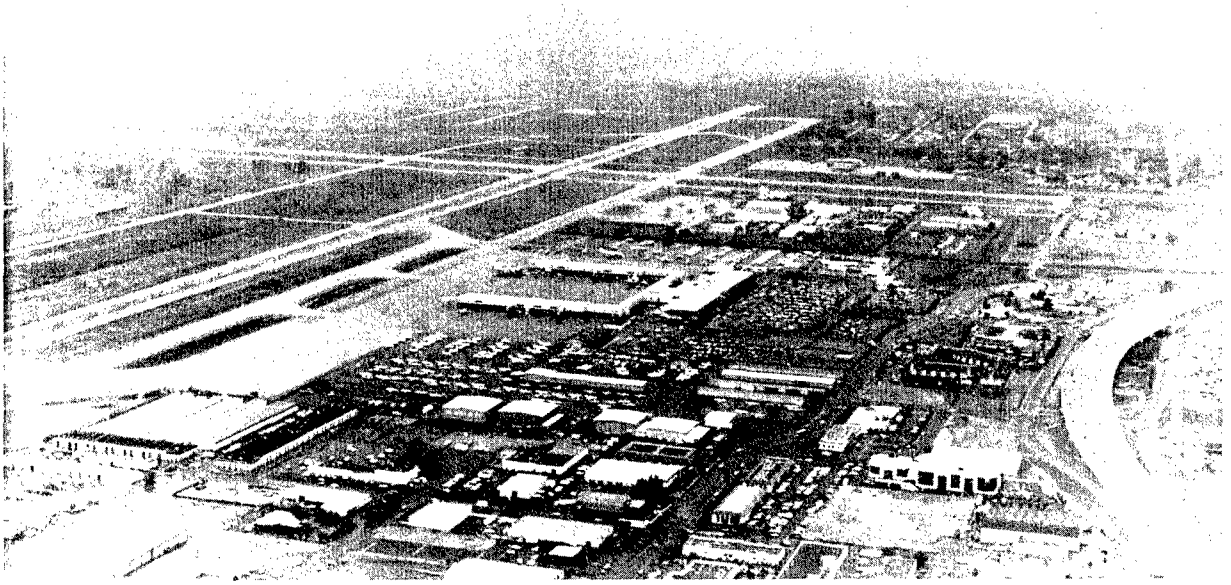
Much of the Reno-Sparks and Truckee Meadows study area is highly developed. Land use within the area varies and includes residential (single family, multiple, mobile home), commercial, industrial, public, and agricultural.

Single-family residential units are the most numerous housing structures found in the entire study area. There are also many multiple residential units (apartment buildings, condominium complexes), and mobile homes in the area.

Commercial land use includes retail trade, service-oriented establishments, and motor freight transportation facilities. A majority of the service oriented establishments, such as the hotels and motels associated with the casinos, are located in downtown Reno. Due to its excellent geographic proximity to the western states, many local and long distance trucking firms have established offices/terminals in the Reno/Sparks area.

Eastern and southern Sparks have a high degree of industrial land use. Manufacturers, wholesale trade establishments, and warehouses are located there.

Overall, public lands and properties comprise almost one-third of the study area. Public land use includes communication and utility services, as well as transportation, recreation, and educational services.



Cannon International Airport in Reno.

Interstate 80 is the main east-west thoroughfare across the basin.

The largest land use category in the study area is agricultural. Agriculture is primarily located in the southern and eastern parts of Truckee Meadows where urban development pressures have not yet intensified. The main crop found is hay, especially alfalfa hay. Much of the land is pasture used for cattle grazing.

6. Transportation.

The City of Reno is served by a wide range of convenient transportation modes. Reno is located at the crossroads of two major highways: U.S. 395 and Interstate 80. A major east-west railroad line passes through the center of the city. An international airport (Cannon) is located less than 3 miles from the heart of downtown Reno. The automobile traffic congestion in the city is partly an offshoot of an active tourist industry and high population growth.

CHAPTER III

PROBLEMS AND OPPORTUNITIES

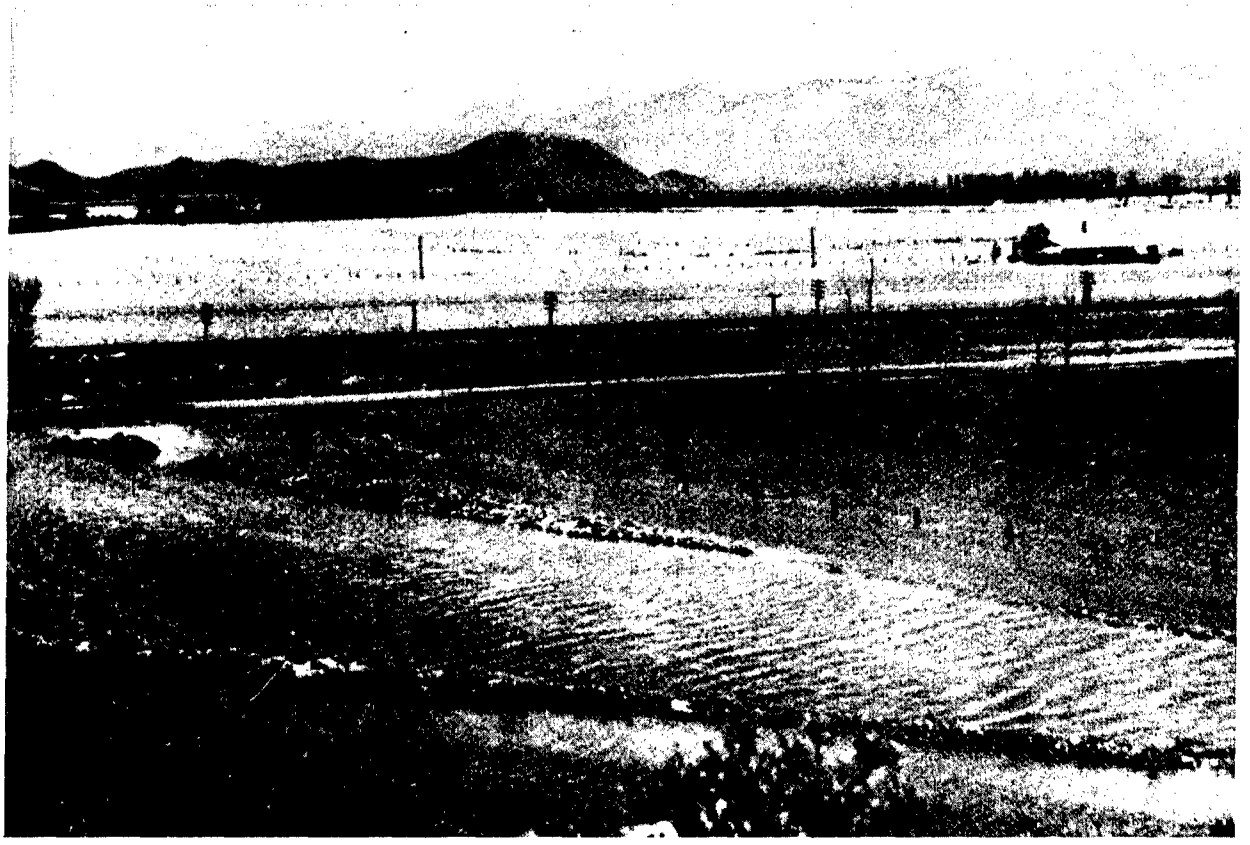
In addition to providing adequate flood protection to the Reno-Sparks Truckee Meadows area, any plan formulated must also address other water resource related problems: improve water quality, provide additional water-based recreation, and improve the natural environment for fish and wildlife.

A. FLOOD PROBLEMS

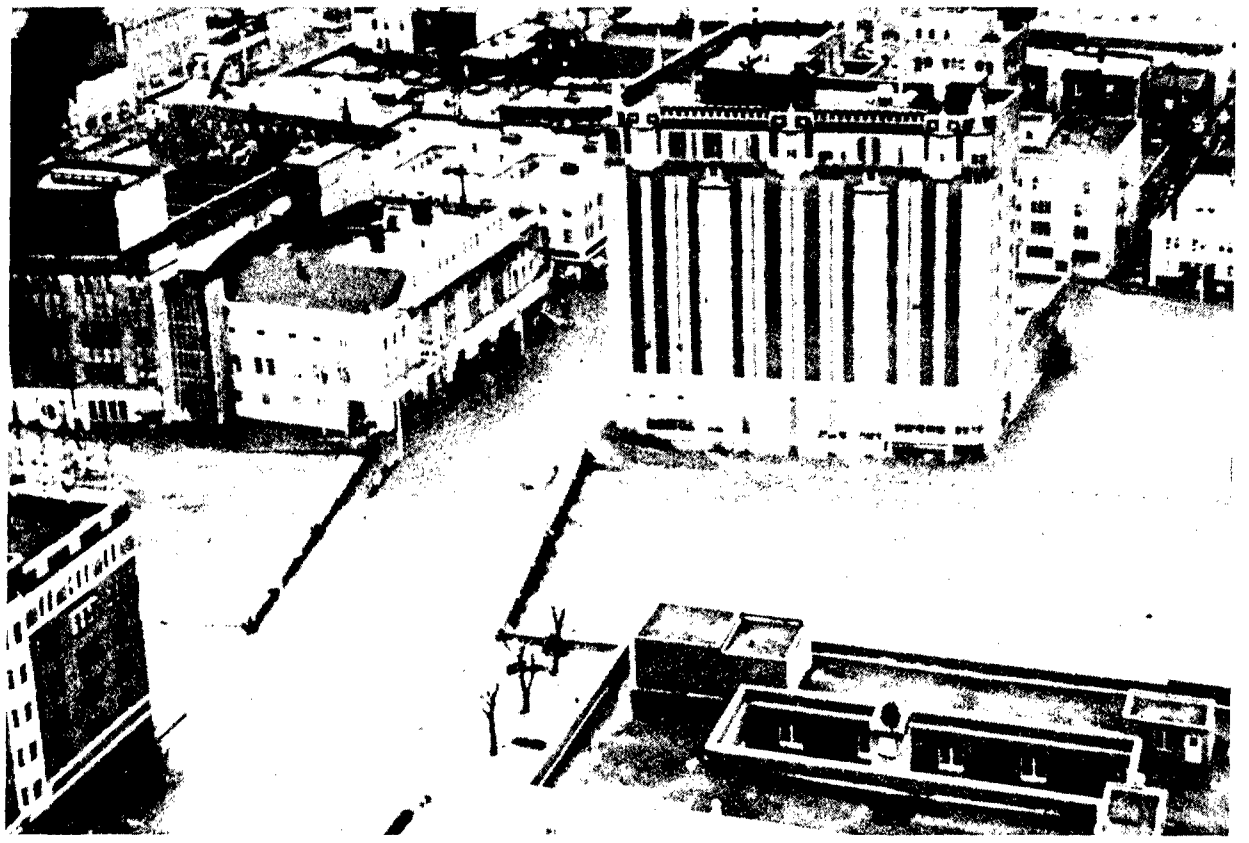
The Reno-Sparks Truckee Meadows area has a long history of floods. Early accounts indicate that flooding or periods of high water occurred during December 1861, January and February 1862, December 1867, January 1886, and May 1890. Floods in the Reno-Sparks Truckee Meadows area are caused by melting snow, cloudbursts, and heavy general rains. Rain floods, which normally occur during the period October through March (characterized by high peak flows and short duration), have caused the major flood problems in the area. Since 1900, significant damaging rain floods occurred in 1907, 1909, 1928, 1937, 1950, 1955, and 1963. Since about 1960, flood control works, consisting of reservoirs and channel modifications, have reduced the magnitude and frequency of flooding in the area. The 1950, 1955, and 1963 floods were similar in magnitude, and were the most damaging rain floods because they occurred after residential and business areas of Reno began to spread to the south and southwest.

The November 1950 flood was the greatest recorded up to that time (streamflow records were begun in 1900), and resulted from a succession of warm rainstorms that produced more than 5 inches of precipitation in one day at some stations in the Truckee River basin. A maximum flow of 19,900 cfs was recorded at Reno where floodwaters extended from West Second Street on the north to Mill Street on the south. All bridges across the river were closed; the Rock Street Bridge was destroyed; and damage to residential, commercial, and other properties totaled about $2.5 million dollars. Floodwater in the central business district was more than 4 feet deep. In Truckee Meadows, about 3,800 acres of agricultural land was flooded. Livestock drowned, crops were destroyed or damaged, land washed away, farm and ranch homes and their furnishings were damaged, and irrigation facilities washed out. Power and other utility lines were extensively damaged.

The largest flood on record to date on the Truckee River in the study area occurred on 23 December 1955 when a peak flow of 20,800 cubic feet per second was measured at Reno. Floodwaters 3 to 5 feet deep covered a strip one to two blocks wide in downtown Reno on each side of the river from Idlewild Park to the eastern city limits. Advance preparations and a well-coordinated flood fighting program helped to reduce flood damage in the downtown Reno area. Water entered some basements; some unprotected buildings in the central commercial district were flooded; and streets, lawns, and shrubbery were buried with sand and debris. In Truckee Meadows, more than 6,000 acres of agricultural land were inundated for 6 to 10 days by floodwaters up to 6 feet deep. Extensive flooding occurred in the Steamboat Creek area where destruction of irrigation headgates let floodwaters into the canals and onto the adjoining lands. Cannon International Airport was inundated with air traffic completely curtailed for several days, and the University of Nevada Agricultural Experiment Station (UNAES) was damaged.

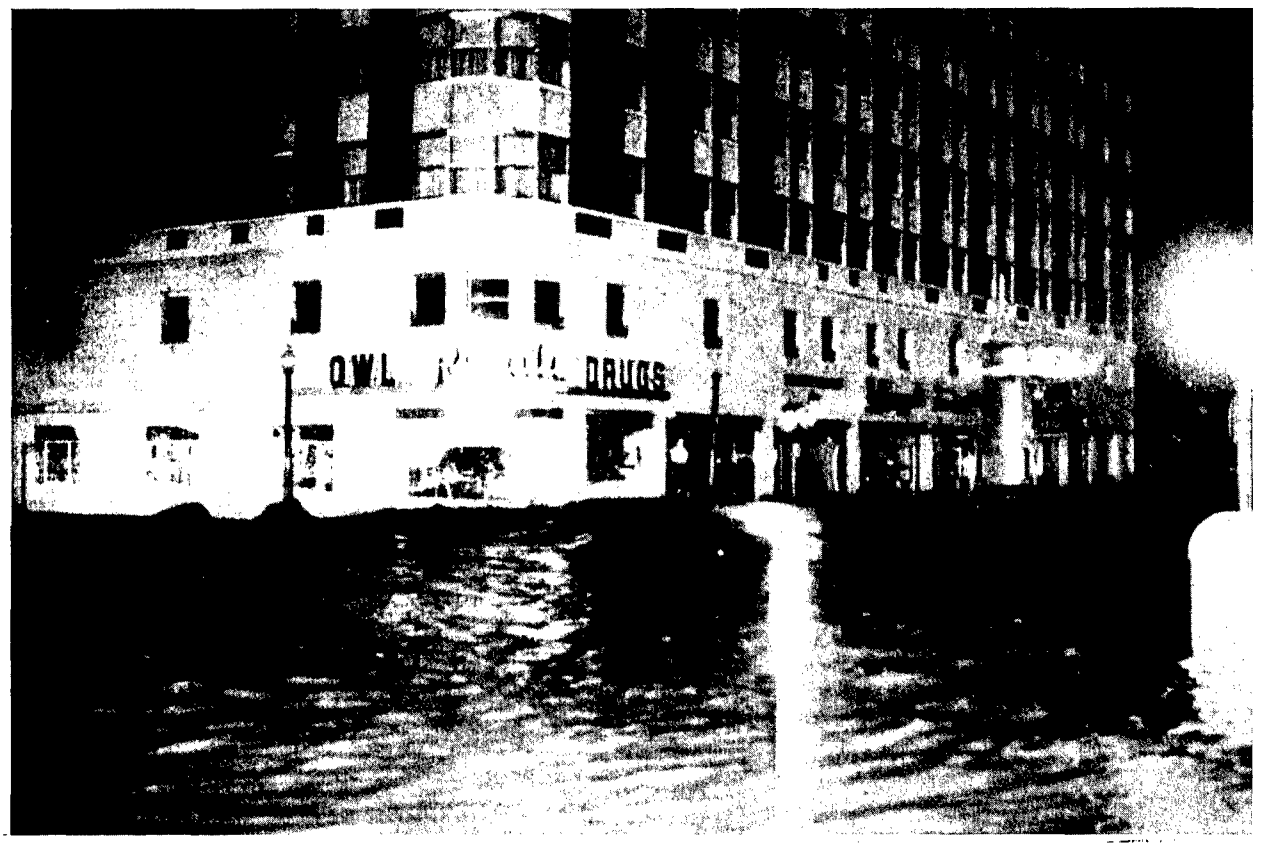


Truckee River during the November 1950 flood looking southwest toward the Huffaker Hills (center distance) and the Sierra Nevada.

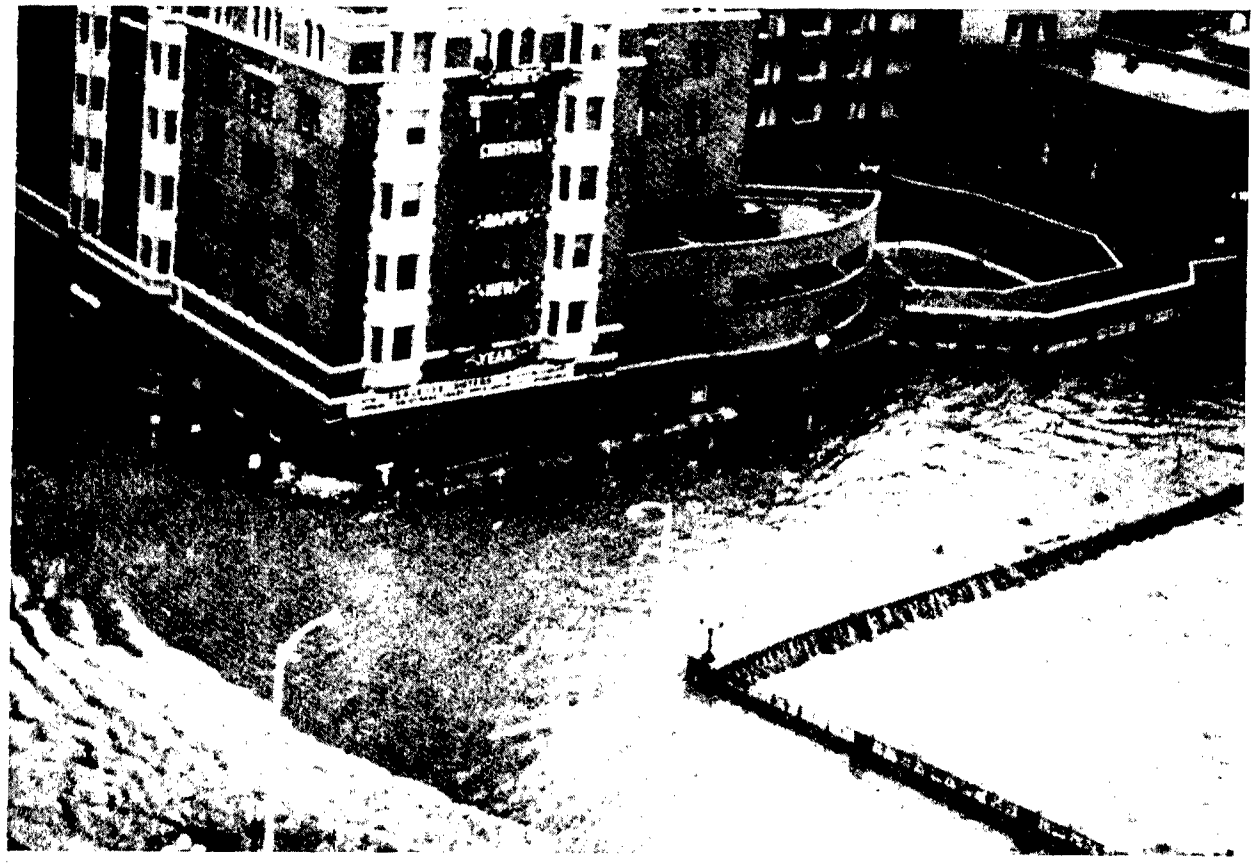


Aerial view of floodwaters on the Truckee River, Reno, in the November 1950 flood

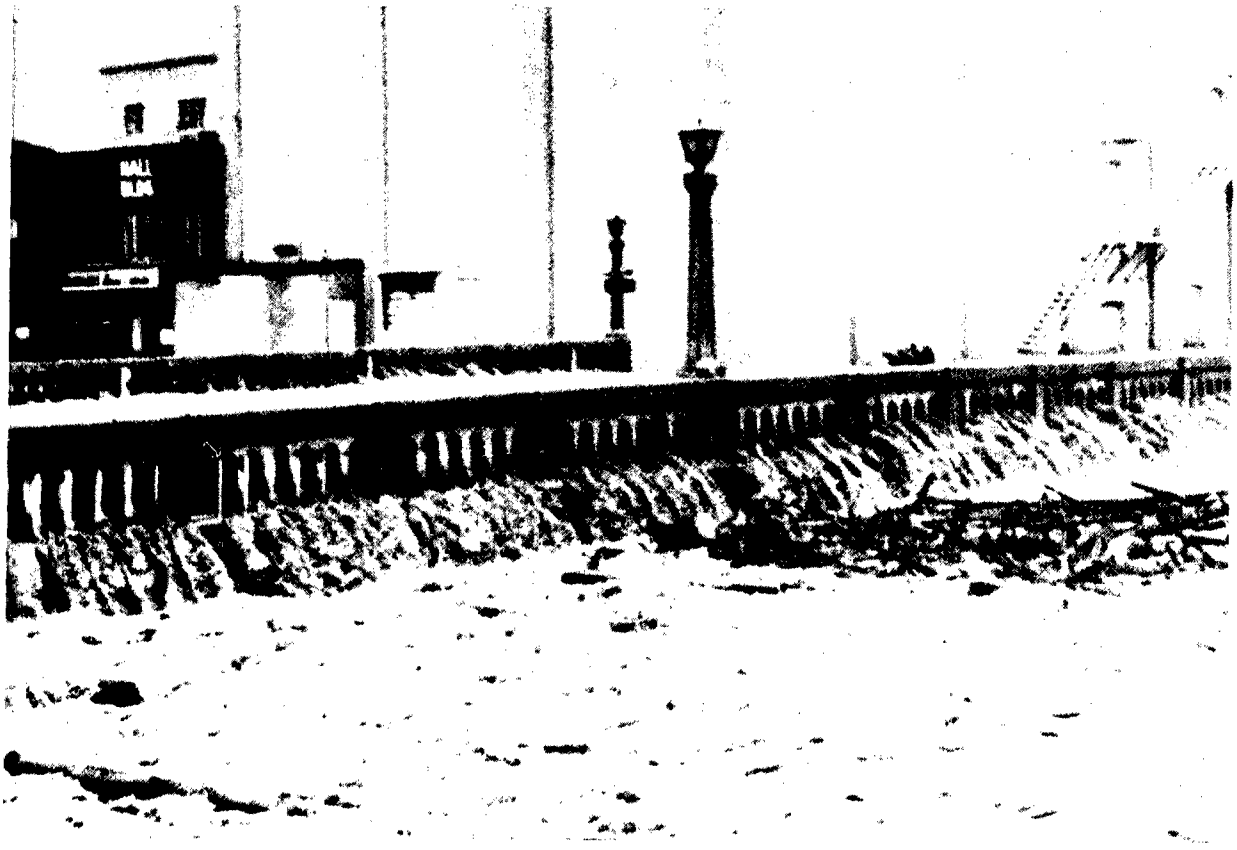
The Truckee River at flood stage in Reno, November 1950 (Gene Christensen photo).



Floodwater at the intersection of First Street and Virginia Street during the November 1950 flood (Gene Christensen photo).



The flooded Riverside Hotel on South Virginia Street, Reno, December 1955 (Gene Christensen photo).



Center Street Bridge, Reno, December 1955 (Gene Christensen photo, courtesy Nevada Historical Society).

Throughout the flooded areas, streambanks were eroded, fences destroyed, baled hay and haystacks ruined, and deep deposits of sand, silt, and debris were left on the land.

The flood of February 1963 inundated essentially the same areas flooded during the 1950 and 1955 floods; that is, a strip one to two blocks wide along each side of the river from Idlewild Park on the west to Coney Island Drive on the east. As in 1955, flood damage was reduced by advance preparation and flood fighting in the downtown area. In 1963 the Cannon International Airport and about 4,000 acres of agricultural lands in Truckee Meadows were flooded.

Cloudburst floods have occurred on the small tributaries in the study area, notably on Peavine Creek on 20 July 1956, when homes, streets, and business establishments located in northwest Reno were damaged by debris and high water. Cloudbursts have caused less extensive flooding on Steamboat Creek and the other tributaries.

Flooding from rapid melting of the mountain snowpack can occur during the period May through July. Snowmelt floods are characterized by moderate peak flows and long durations, but rarely cause significant damage in the study area. The most notable snowmelt flood occurred on 3 May 1952 when a peak 1-day mean flow was recorded at 7,950 cubic feet per second.

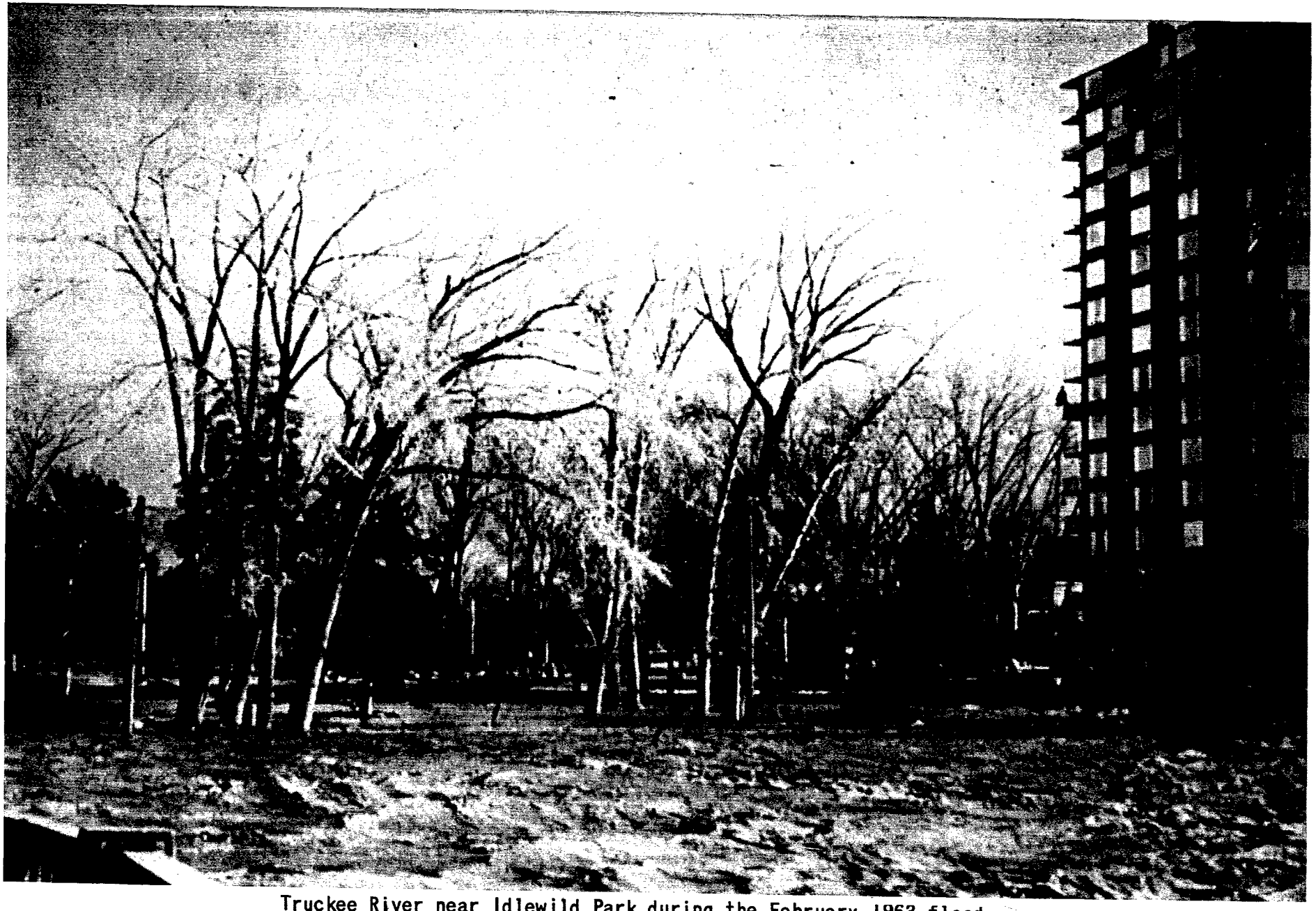
Completion of several projects has helped lessen the severity of Truckee River floods. Two of the most recent projects are Martis Creek Lake on Martis Creek (completed 1972 - Corps of Engineers) and Stampede Reservoir on Little Truckee River (completed 1970 - U.S. Bureau of Reclamation). Although potential flood damages have been reduced by the construction of these projects, a serious flood problem remains in the expanding Reno-Sparks Metropolitan area. Officials of Reno, Sparks, and Washoe County have on numerous occasions expressed their desire for additional flood protection for the area.

Historical flows and damages caused by the most recent significant floods in the area, based on prices and conditions at the time of the flood, are shown in Table 9. The table also presents the dramatic increase in flood damages that would result from recurrence of these major historic events.

The significant increase in damages would result primarily because of extensive development of damageable properties in the flood plain and the conversion of agricultural lands to a highly developed industrial complex. Also, the inflated value of damageable property since the occurrence of historical flooding is reflected in increases in damage.

The 100-year and SPF flood plains, shown on Plate 3, consist of the downtown section of Reno, a fringe area on the south and east of the city of Sparks, and the Truckee Meadows. The Meadows begins near the eastern city limits of Reno and extends to the narrow canyon at Vista.

The channel capacity of the Truckee River through Reno is about 14,000 cfs. Flows of this magnitude have an average frequency of occurrence of once in about 60 years under current upstream conditions. The Truckee River below



Truckee River near Idlewild Park during the February 1963 flood.

TABLE 9

FLOODS OF RECORD
(Reno Gage)

Date of Flood	Peak Flow (c.f.s.)	Exceedence Intervals 1/ (Years)	Estimated Damage (Dollars)	
			At Time of Flood	Recurrence in 1982 2/
November 1950	19,900	114	2,470,000	178,000,000
December 1955	20,800	125	1,680,000	277,000,000
February 1963	18,400	100	1,680,000	124,000,000
December 1964	11,300	40	1,320,000	20,000,000

1/ Exceedence frequency of historic peak flows from current condition peak flow frequency curve at Reno.
2/ Damages are based on a recurrence of the historical peak flow under 1982 conditions and October 1984 price levels.

the US 395 bridge has a capacity of between 6,000 and 7,000 cfs. Under present conditions, overflow of the river is estimated to occur once every 12 years, on the average.

The 100-year floodflow at Reno is 18,500 cfs and would cause flooding averaging from 2 to 4 feet deep in the Meadows area and result in $133,120,000 of estimated damage (October 1984 prices, 1982 conditions). The SPF flow is 38,500 cfs at Reno and would cover about 9,500 acres in the Meadows area to depths of from 6 to 7 feet, result in $1,036,300,000 of estimated damage (October 1984 prices, 1982 conditions). The estimate of damageable property in the Truckee Meadows standard project flood plain, excluding the value of lands, roads, bridges, utilities, and railroads, is $2.7 billion (October 1984 prices, 1982 conditions).

B. WATER QUALITY PROBLEMS

The Truckee River also has water quality problems. Three major sources of man-made or man-induced pollution discharged into the Truckee River as it flows from the Nevada State line to the Pyramid Indian Reservation include (1) agricultural return flows from irrigation water diverted from the Truckee River, (2) urban runoff during and following storm events, and (3) effluent from the Reno-Sparks Waste Water Treatment Facility (WWTF) which enters via Steamboat Creek.

Urban runoff during an intense storm appears to be the dominant short-term source of loads for suspended and dissolved solids, fecal coliform, and heavy metals (cadmium, chromium, copper, and lead). Urban runoff is also the largest source of BOD load.

The loads from irrigation return flow during the irrigation season and the WWTF are continuous and have remained at relatively constant magnitudes. However, as a consequence of the changing character of the community, the discharges of the WWTF and urban stormwaters will become the dominant influence on the water quality of the Truckee River, and the influence of the agricultural community will diminish. Steamboat Creek and North Truckee Drain receive nearly all of the agricultural return flows from irrigation in Truckee Meadows. In addition, the two outlets receive approximately 50 percent of the urban storm runoff from Reno and Sparks.

At the present time, the Washoe Council of Governments is designated by the Governor of the State of Nevada as the agency responsible for water quality management planning within all of Washoe County outside the Lake Tahoe basin. The cities of Reno and Sparks and Washoe County are currently engaged in wastewater operations and regulatory programs related to water quality and follow the 1978 Washoe County Water Quality Management Plan. Each of these governments has sufficient legal powers to be designated as water quality management agencies, and each is given a role in implementing the system which is an extension of its present responsibilities.

Financing water quality management and planning in the future will be a problem for the designated agencies, especially in enforcing non-point control measures. Therefore, the management system integrates water quality management and planning activities with other general purpose governmental activities to the extent possible, thereby eliminating the potential of duplicating certain actions.

The Washoe County 208 Water Quality Management Plan includes extensive street sweeping and sedimentation basins on the North Truckee and Steamboat Drains as the most cost effective strategies to achieve water quality objectives. Improved street cleaning requires street parking and anti-litter ordinances and more effective street sweeping practices. Improved construction practices, a revised subdivision ordinance, and increased silt and erosion control will prevent or reduce the accumulation of these materials on the streets.

Recent State regulations will enforce these storm-water quality strategies. Effective 16 October 1980, the Nevada Diffuse Source Water Pollution Control Regulations require the implementation of the above measures. The application of management practices defined in the Regional 208 Water Quality Management Plan should also help to resolve water quality problems.

C. RECREATION PROBLEMS AND OPPORTUNITIES

The Truckee River is the most important water-oriented recreation resource in the region and the only stream of its kind close to the Reno-Sparks market area. Local and State agencies have recognized the need for recreation access to the river. Steamboat Marsh is an important natural area and is the only wetland area of its kind in the region that is available to the market area.

Certain problems and needs are associated with recreation use of the area. Those problems and needs are described below.

In general, demand for recreation facilities increases as the population increases. The current number of recreation facilities in the study area is inadequate for existing and future demand. The State of Nevada's Statewide Comprehensive Outdoor Recreation Plan (SCORP), "Recreation in Nevada," 1982, identifies the recreation supply and demand for the planning region (Planning Region 1) where the study area is located. Since most of Planning Region 1's population is in Washoe County and about 70 percent of Washoe County's population is located in the Reno-Sparks area, it is reasonable to assume that a significant portion of the identified demand applies to this area. According to SCORP, Planning Region 1 is deficient in certain types of recreation facilities, including fishing access, bicycle trails, and picnic facilities (see Table 10).

Based on Corps studies and input from local agencies, additional public recreation access to the Truckee River is needed for fishing, swimming, rafting/tubing, picnicking, bicycling, walking, and jogging. There is also a demand for parks and paths in the Truckee Meadows area.

A continuous recreation corridor along the Truckee River needs to be completed. Portions of the river have already been developed for recreation access: the City of Sparks river resources are well developed and Reno also has some developed features. The opportunity exists to connect these developed features. Planned recreation developments by the cities of Reno and Sparks would assist in meeting the needs and demands for a river oriented recreation corridor. Additional recreation developments would be required to fully satisfy this need for the area.

TABLE 10

REGION I
SUMMARY OF RECREATION SUPPLY, DEMAND AND NEED

DESCRIPTION	1980	1985	1990	1995	2000
Fishing, Stream-Miles of Stream					
Demand	1,388	1,616	1,843	2,099	2,360
Supply	462	462	462	462	462
Need	926	1,154	1,381	1,637	1,898
Bicycling-Miles of Trail					
Demand	406	487	571	658	750
Supply	18	18	18	18	18
Need	388	469	553	640	732
Picnicking-Number of Tables					
Demand	1,274	1,498	1,732	1,973	2,229
Supply	1,332	1,332	1,332	1,332	1,332
Need	0	166	400	641	897

SOURCE: Nevada Statewide Comprehensive Outdoor Recreation Plan, 1982.

There is also a need to develop recreation facilities near expanding population centers in Truckee Meadows and connect to those facilities with paths to the river developments.

There is a need to protect open some space from urban encroachment and competing land uses.

Flood control alternatives have the potential to provide opportunities for increased recreation access for fishing, swimming, rafting/tubing, picnicking, bicycling, walking, and jogging. Increased recreation access and facilities will alleviate demand for more recreation facilities in the area. The alternatives also provide opportunities for protecting open space along Truckee River and in Truckee Meadows.

D. FISH AND WILDLIFE PROBLEMS AND OPPORTUNITIES

The rapidly expanding industrial and residential development and farming in Truckee Meadows have resulted in a loss of fish and wildlife habitat and degradation to portions of the remaining habitat. Fish habitat along the Truckee River below Vista still supports a somewhat marginal population of cold water fish. The threatened Lahontan cutthroat trout and endangered cui-ui require special management considerations for population recovery. Basic habitat quality problems are water temperature and nutrient load.

Most of the Meadows area had been valuable wildlife habitat before settlers moved into the area in the late 1800's. The marshlands, seasonally flooded areas, and riparian vegetation along the Truckee River and Steamboat Creek have been greatly reduced since then. In the west, wetland/riparian habitats have been reduced to only about 10 percent of the original acreage. Well over half of the bird species present in the study area are dependent upon riparian and marsh vegetation as a major habitat component.

The cities of Reno and Sparks have already established a river park system which protects much of the riparian vegetation. The endangered species staff of the Fish and Wildlife Service (Great Basin Complex Office), is studying cutthroat and cui-ui habitat requirements in order to establish habitat rehabilitation programs. The "National Waterfowl Management Plan for the United States" lists Nevada at priority rank 10 out of 32 for waterfowl habitat preservation. Opportunities exist for protecting and improving remaining fish and wildlife habitat.

A flood control project could include measures to significantly protect and improve fish and wildlife habitat within project lands. Fish habitat improvements could be attained with instream habitat management using materials available during construction of the flood control features. Water quality improvements for temperature and pollution could be accomplished on project lands by planting riparian vegetation and managing marsh habitat. The riparian vegetation habitat type could replace some of that lost due to past development of the Truckee Meadows, and marsh vegetation management would preserve and expand this remaining wildlife habitat.

E. WATER SUPPLY NEEDS

Sierra Pacific Power Company provides water service to a majority of the present population of the Truckee Meadows area under a water service

Steamboat marsh area provides a valuable resource for wildlife habitat.

franchise. It is projected that future water needs associated with increased urban development will exceed currently held water rights owned by Sierra Pacific. Because of this, the company has been acquiring decreed water rights at an average rate of 900 acre-feet a year. Also, the company has initiated a water service waiting list for proposed new developments so that those who apply for water will be served only when sufficient rights are acquired.

Through the Orr Ditch Decree of 1944, the Truckee Meadows area was allocated 149,000 acre-feet of Truckee River water yearly. Half of these rights are presently allocated to urban uses, and half to agriculture. Of the agricultural rights, 28,000 acre-feet/year are unused, possibly being held for speculation. If Sierra Pacific can acquire this block of water, the company's water rights would total 90,337 acre-feet/year, or 78,112 acre-feet/year in a drought year. This would meet Truckee Meadows water demand for the next 5 to 10 years. It is projected that the City of Reno will need over 70,000 acre-feet of water/year by the year 2000, with a current supply of over 43,000 acre-feet (1985).

Ground water can be pumped during a drought year at a safe yield of 12,000 acre-feet/year, according to Sierra Pacific Power Company. However, in recent years groundwater has been pumped at a higher rate than that recommended by Sierra Pacific during drought years. The additional ground water pumpage results in ground water pollution and insufficient aquifer recharge. Increased ground water pumpage could also draw the water table below the depth of many private wells in the Truckee Meadows and draw water out of the Truckee River bed. Impacts of ground water pumpage should be fully studied.

CHAPTER IV

TECHNICAL STUDIES

Numerous technical studies were conducted during this investigation to provide the basis for formulating a plan of improvement which would provide increased flood protection, recreation, and fish and wildlife enhancement to the Reno-Sparks Truckee Meadows area. The results of those studies are provided below.

A. HYDROLOGIC STUDIES

1. Storms and Flood Analysis.

Hydrologic studies for the Truckee River basin included rainfall/runoff modeling, flow/frequency analysis, and Standard Project Flood determination.

The analyses were made by developing a mathematical computer model to simulate the rainfall/runoff response of the basin. The computer program used was the HEC-1, Flood Hydrograph Package. The analyses included a determination of base flows, loss rates, unit hydrographs, and flood routing parameters. The influence of snowpack on runoff was determined by using computational procedures developed by the Bureau of Reclamation and described in Engineering Monograph US35 "Effects of Snow Compaction Runoff from Rain on Snow," dated June 1966, and used in the Sacramento District Computer Program "Rain-on-Snow".

The December 1955 and February 1963 storms and floods represent two of the largest general rain floods in the basin for which flood hydrograph, precipitation and snow data are available and were used to calibrate the model. Basin precipitation for these storms was determined from isohyetal maps prepared from available precipitation data.

For purposes of hydrologic analysis, the basin model was subdivided into smaller units at various stream gage locations, lakes, and reservoirs, to facilitate the analysis of the historic floods. Plate 4 displays subarea delineations for the basin model. Many smaller subdivisions were made around Reno to facilitate possible future studies of this urban area. Because of the large surface area and volume of Lake Tahoe relative to its drainage area, runoff into the lake during rain flood periods is completely regulated, and any releases are made after the peak flood period. Accordingly, the area above Lake Tahoe basin was not included in the analysis.

2. Land Use.

Hydrologic studies were developed for both present (1980) land use conditions and estimated future (1990) land use conditions. Effects of future land use changes on runoff were accounted for by lowering loss rates in proportion to the imperviousness of the subareas. Runoff calculations indicate that land use changes have a negligible effect on peak flows at the points of interest because the increase in urbanized area, when compared to the total drainage area above the points of interest, is very small. Accordingly, peak flow frequency curves used in this study are based on 1990 land uses and are considered to represent both existing and future land use conditions.

3. Flow-Frequency Analysis.

Rain flood flow-frequency curves were developed for locations listed in Table 11. Frequency curves developed for the Truckee River represent unregulated and regulated conditions of water resource development. Unregulated conditions represent a runoff regime without Boca, Stampede, Prosser, and Martis Creek Reservoirs but include the effects of Lake Tahoe, Independence Lake, and Donner Lake. Regulated conditions represent the effects of Boca, Stampede, Prosser, and Martis Creek Reservoirs.

All design flows used in plan formulation were based on the regulated condition frequency curves. The Reno and Vista gage regulated condition frequency curves are shown on Figures 2 and 3, respectively.

Flow-frequency curves for Steamboat Creek, Galena Creek, and Hunter Creek at the stream gage locations were prepared from an analysis of the streamflow record. These frequency curves were used as the basis for developing flow-frequency relationship for ungaged streams in the area. The ungaged streams include Evans, Dry, Thomas, and White's Creeks and Boynton Slough. This area is subject to both winter general rain floods and summer cloudburst floods. General rain events produce the highest peak on Steamboat Creek, and cloudburst events produce the highest peak on Boynton Slough. Frequency curves for Boynton Slough and Steamboat Creek used in plan formulation are shown on Figures 4 and 5, respectively.

4. Standard Project Floods.

Standard Project Floods (SPF) were computed for the Truckee River and the tributaries within Truckee Meadows. Both general rain and cloudburst events were analyzed. The general rain event produces the highest peak flows on the Truckee River, whereas the cloudburst event produces the highest peak flows on the tributaries within Truckee Meadows.

A snowpack was assumed to exist over the Truckee River basin prior to the occurrence of the standard project general rainstorm because normally a snowpack is present on the basin in the wintertime. There would be no snowpack prior to a cloudburst storm because cloudburst storms occur during the summertime.

5. Probable Maximum Floods.

General rain and cloudburst probable maximum floods (PMF) were developed for Steamboat Creek at the Huffaker Hills damsite. Both types of floods were considered since it is not known which type would be critical for spillway design. A snowpack was assumed to exist over the basin above the Huffaker Hills damsite prior to the occurrence of the general rain PMF (most likely to occur in December-January) because there is normally a snowpack on the basin in the wintertime.

B. HYDRAULIC STUDIES

1. Analysis

Hydraulic studies of the Truckee River were conducted to determine the existing flow regime of the river and to evaluate the effectiveness of various flood control alternatives. Due to the unsteady nature of the river flows during the 100-year and SPF flood events, a simplified technique was

Table 11

FLOW-FREQUENCY CURVES
DEVELOPED FOR THE TRUCKEE RIVER BASIN

INDEX POINT NO	DESCRIPTION	DRAINAGE AREA (Sq. Mi.)	CURVES
3460	Truckee River at Farad (USGS #3460)	426 1/	Peak and Volume
600	Truckee River at Reno (USGS #3480)	561 1/	Peak and Volume
700	Truckee River near Vista (USGS #3500)	819 2/	Peak and Volume
720	Truckee River below Derby Dam (USGS #3516)	1,060 2/	Peak and Volume
740	Truckee River near Nixon (USGS #3517)	1,205 2/	Peak and Volume
30	Steamboat Creek at Steamboat (USGS #3493)	39.3 2/	Peak and Volume
60	Steamboat Creek at Huffaker Hills Damsite	110.4 3/	Peak
84	Steamboat Creek at Mouth	162.3 3/	Peak
20	Galena Creek near Steamboat (USGS #3489)	8.5	Peak
505	Hunter Creek near Reno (USGS #3476)	11.5	Peak
44	Whites Creek at Steamboat Ditch	14.6	Peak
66	Evans Creek at Steamboat Ditch	8.4	Peak
622	Dry Creek at Steamboat Ditch	3.6	Peak
64	Dry Creek at Highway 395	14.8	Peak
48	Thomas Creek at Steamboat Ditch	11.4	Peak
70	Boynton Slough	42.0	Peak
620	North Truckee Drain at Foothill Line	58.9 4/	Peak

1/ Contributing area below Lake Tahoe.
2/ Contributing area below Lake Tahoe and Washoe Lake.
3/ Contributing area below Washoe Lake.
4/ Contributing area.

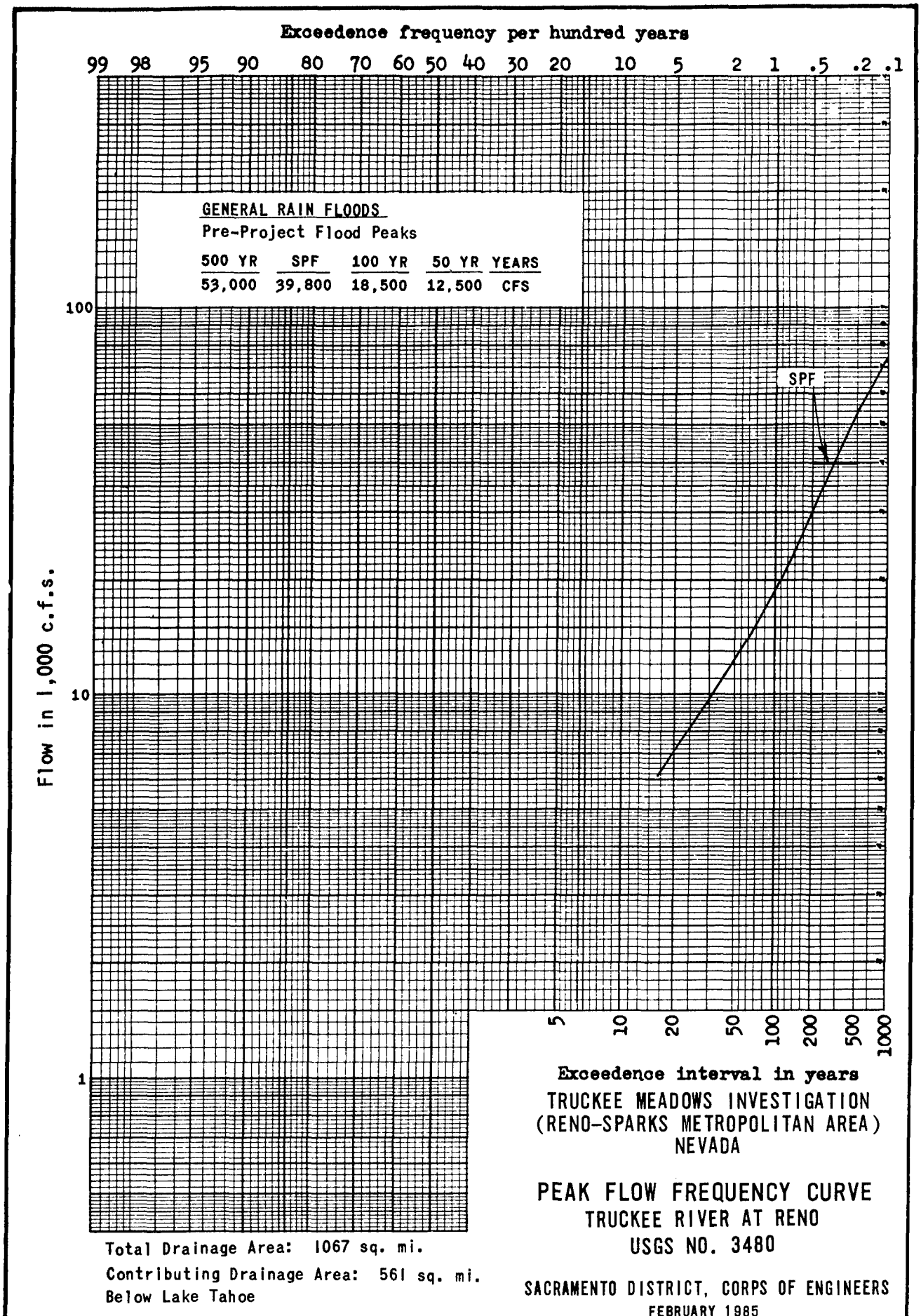

Exceedence frequency per hundred years
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1
GENERAL RAIN FLOODS
Pre-Project Flood Peaks
500 YR SPF 100 YR 50 YR YEARS
53,000 39,800 18,500 12,500 CFS
SPF
100
10
1
Flow in 1,000 c.f.s.
5 10 20 50 100 200 500 1000
Exceedence interval in years
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
PEAK FLOW FREQUENCY CURVE
TRUCKEE RIVER AT RENO
USGS NO. 3480
Total Drainage Area: 1067 sq. mi.
Contributing Drainage Area: 561 sq. mi.
Below Lake Tahoe
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 2

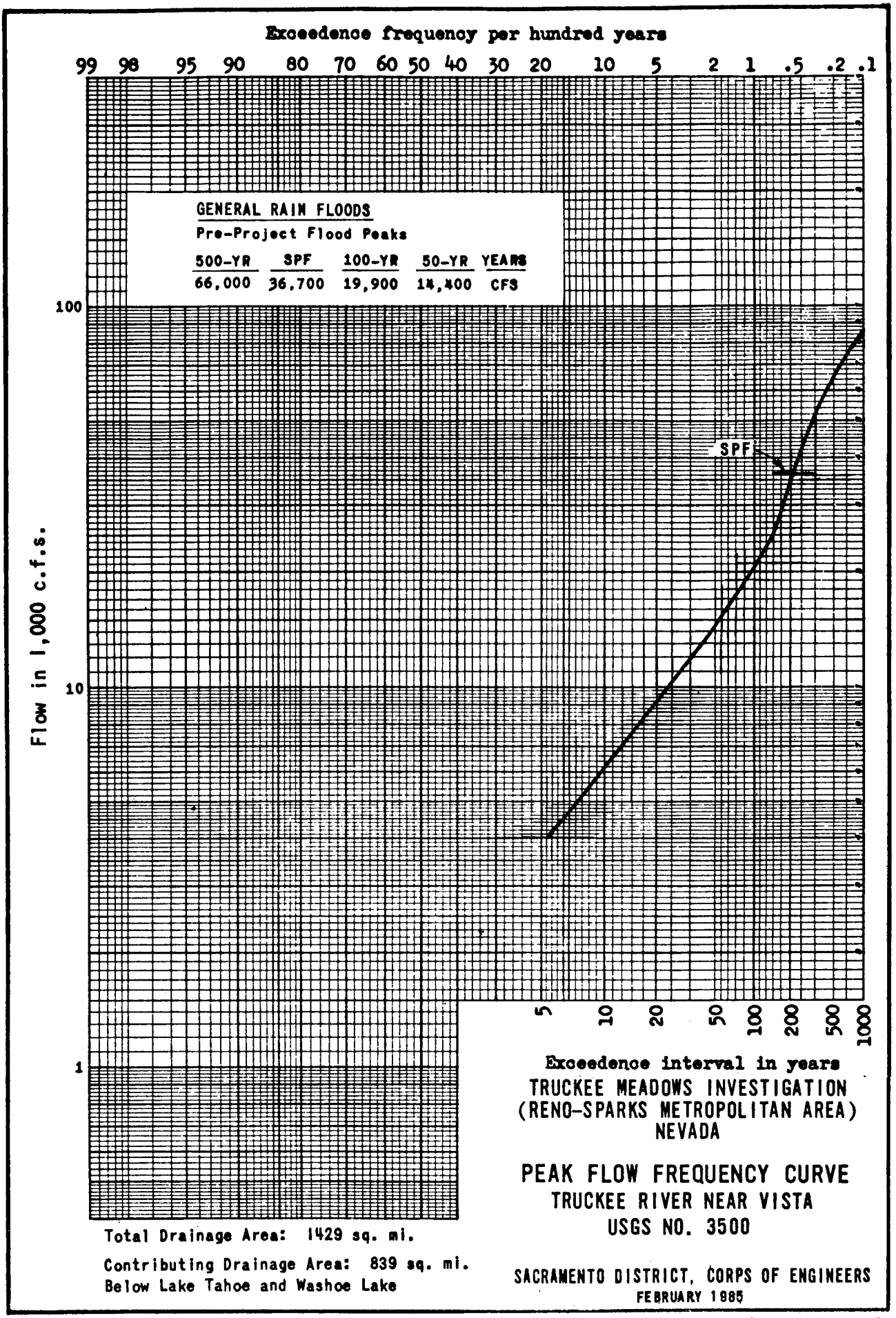
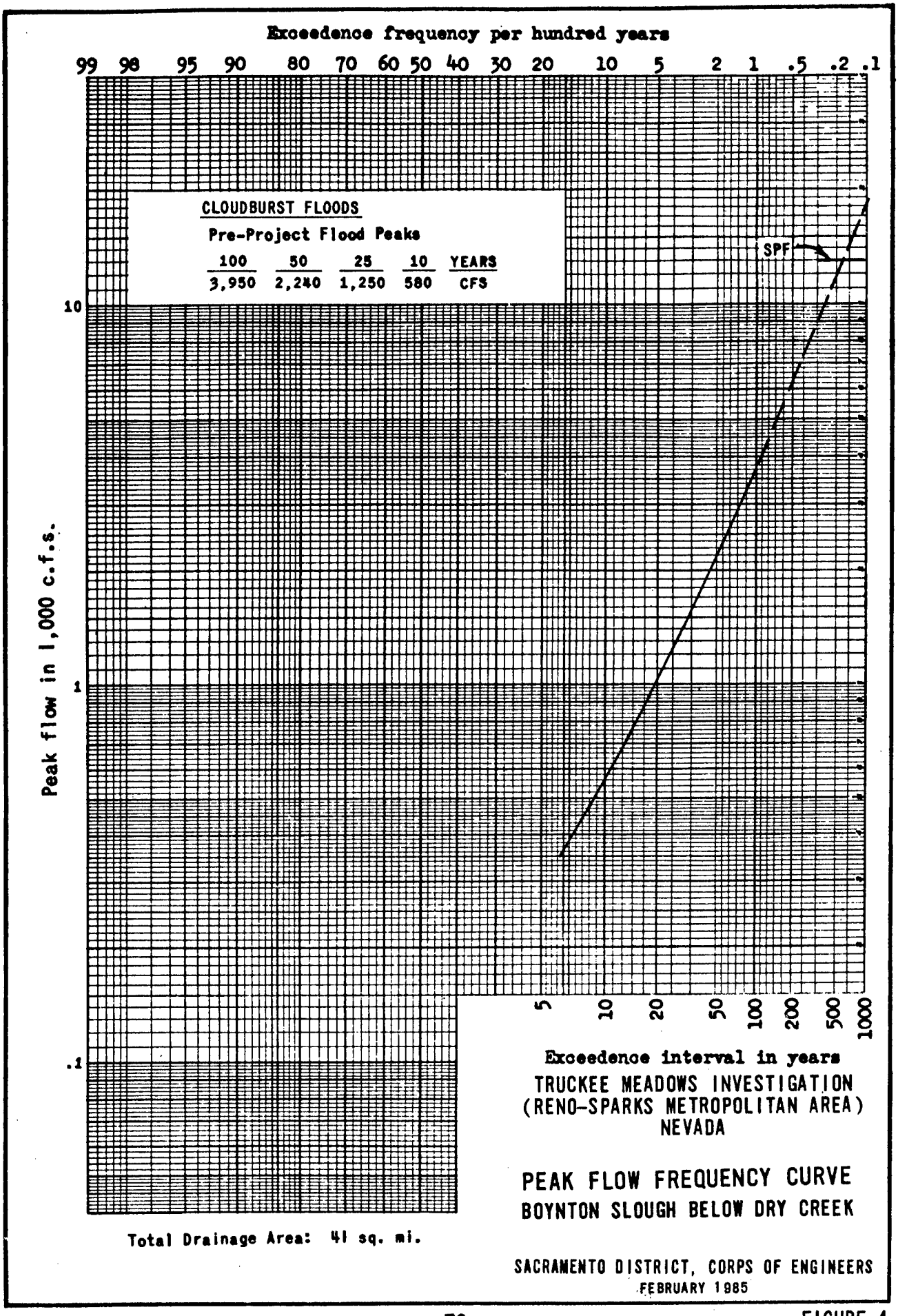

Exceedence frequency per hundred years
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1
GENERAL RAIN FLOODS
Pre-Project Flood Peaks
500-YR SPF 100-YR 50-YR YEARS
66,000 36,700 19,900 14,400 CFS
100
10
1
Flow in 1,000 c.f.s.
SPF
5 10 20 50 100 200 500 1000
Exceedence interval in years
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
PEAK FLOW FREQUENCY CURVE
TRUCKEE RIVER NEAR VISTA
USGS NO. 3500
Total Drainage Area: 1429 sq. mi.
Contributing Drainage Area: 839 sq. mi.
Below Lake Tahoe and Washoe Lake
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 3



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

PEAK FLOW FREQUENCY CURVE
BOYNTON SLOUGH BELOW DRY CREEK

Total Drainage Area: 41 sq. mi.

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 4

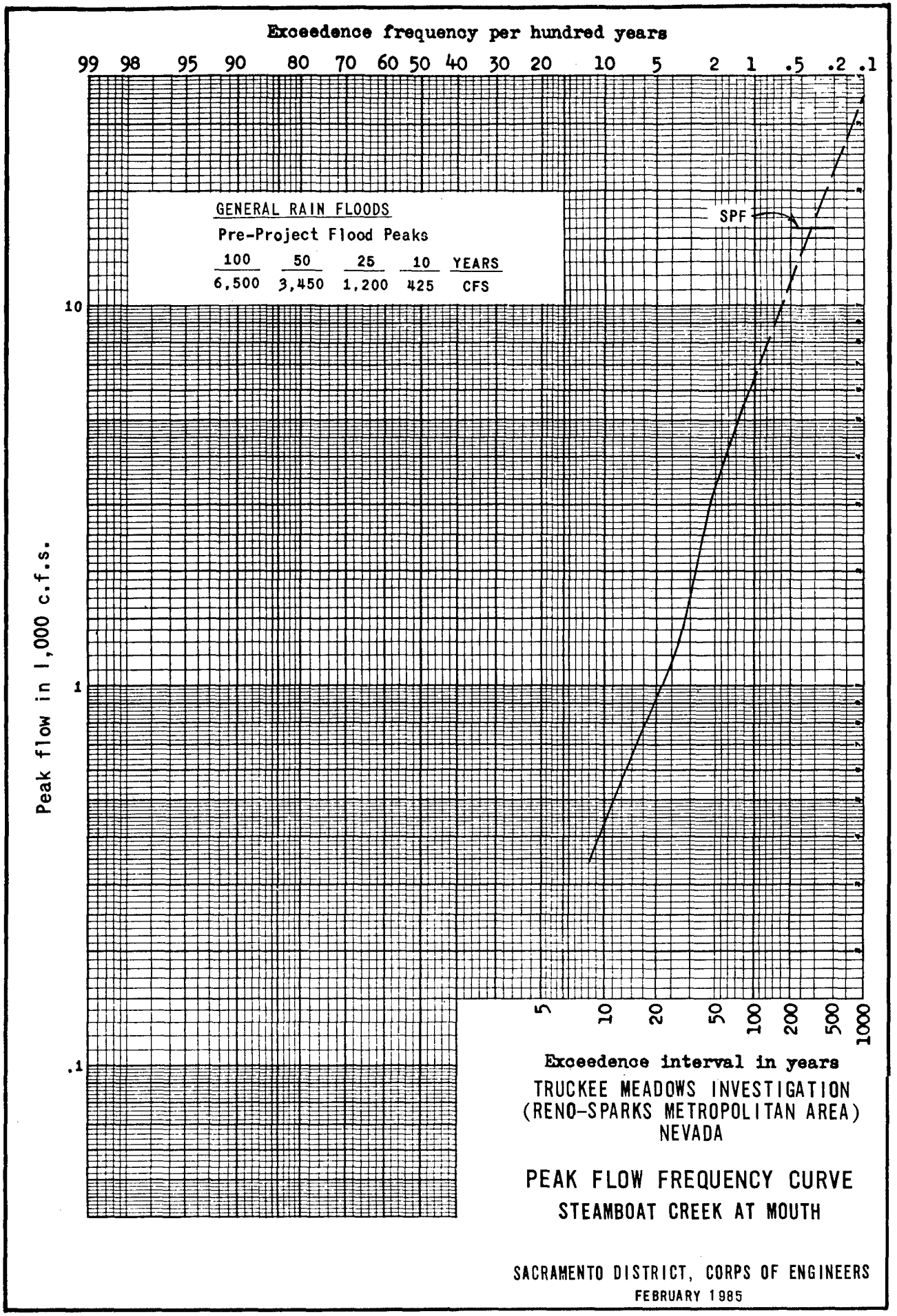

Exceedence frequency per hundred years
99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 .5 .2 .1
GENERAL RAIN FLOODS
Pre-Project Flood Peaks
100 50 25 10 YEARS
6,500 3,450 1,200 425 CFS
SPF
10
1
.1
Peak flow in 1,000 c.f.s.
5 10 20 50 100 200 500 1000
Exceedence interval in years
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
PEAK FLOW FREQUENCY CURVE
STEAMBOAT CREEK AT MOUTH
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 5

used to analyze the hydraulics and develop the water surface elevation, flood plains, and breakout flows for these events. Breakout flows were defined as flood flows leaving the main Truckee River floodway (main channel and overbank) thereby reducing the total river flow. This simplified technique involved a combined hydraulic and hydrologic routing of flows through the study reach, accounting for main channel, overbank and breakout discharges. Hydrographs at two hour time intervals for the 100-year and SPF floods were utilized at Reno and Vista gages. These are based on HEC-1 computer simulation models of the floodway and basin.

The current version of the HEC-2 computer program, "Water Surface Profiles," (Modification 54, Error Correction 05) was used to compute water surface profiles for a range of discharges by the Standard Step Method for preproject conditions and for various flood control alternatives. Geometric data (as well as bridge data) for cross sections spaced approximately 1,000 feet apart representing existing conditions were available for the study reach from a 1975 Flood Insurance Study. Manning's equation was used to evaluate the effect of boundary roughness (i.e., friction losses on floodway water surface elevations). Mannings "n" values were initially estimated at each cross section location and "calibrated" based on measured discharge and high water mark data for the 1963 flood which has an estimated recurrence interval of 100 years. Mannings "n" values ranged from a minimum in the main channel of 0.025 for the concrete-lined channel through downtown Reno where the banks are vertical concrete walls to a maximum of 0.040 for "natural" channel, and a maximum of 0.060 in the overbanks. The various flood control alternatives were simulated by the use of the "X3" card encroachment option (for levees) and the Channel Improvement option (for channel excavation) of HEC-2.

2. Results.

The 100-year and SPF preproject flood plains produced from these studies are presented on Plate 3.

C. SEDIMENTATION STUDIES

Sediment transport within the project area was studied to evaluate the existing sedimentation characteristics of the Truckee River subbasin from Verdi to Vista. Sediment-related impacts of various alternative flood control plans in that area were evaluated.

Sediment production and transport through the Reno-Sparks Truckee Meadows area can occur in several different ways. Sediment-related problems often occur during and after floodflows. Rainstorms and melting snow cause water-induced soil erosion. Erosion of fragile upland forest and rangeland accounts for about three-fourths of the gross erosion in the Truckee River basin. Sheet and rill erosion are responsible for approximately 70 percent of the total water-induced erosion, with channel bed and bank erosion contributing the remaining 30 percent.

In addition to water-induced erosion, aeolian erosion (wind erosion) occurs over most of the rangelands and flat portions of the Truckee River basin. Man-induced erosion and sediment production occur at various

locations throughout the basin due to poor agricultural and range management practices (such as logging and grazing activities), and due to urban and recreational developments.

1. Sediment-related Stream Characteristics.

The Truckee River is a pool and riffle type perennial stream from Verdi to Vista with several manmade bridge crossings and diversion stuctures along the way. The channel bed is armored with materials ranging in size from pebbles and cobbles up to boulders several feet in diameter. The prevalence of large-sized bed materials such as boulders decreases from Verdi to Vista. This tendancy for decreasing bed material sizes continues past Vista all the way to Pyramid Lake, where the dominant grain sizes on the bed are sands and silts.

Based on visual observations throughout the project area, no sediment-related problems are obvious in the Truckee River or in the tributaries within the Truckee Meadows. Localized debris accumulation, beaver activity, and minor aggradation through the City of Reno were observed.

2. Erosion and Sediment Production.

In order to evaluate sediment sources and transport mechanisms along the Truckee River, the greater Truckee River basin was subdivided into eight subbasins. Each subbasin was then examined individually and the contribution of sediment into the Truckee River from each was determined.

a. Basinwide Average Annual Sediment Production. - The total estimated sediment production from Lake Tahoe to Vista is approximately 122,700 tons (102,700 cubic yards)/year. This is based on the assumption that all of the sediment delivered to the Truckee River from the contributing watersheds continues through the system without depositing.

b. Estimated 100-year Flood Sediment Production. - Estimating sediment production and delivery due to intense rainstorms is a difficult task due to many complicating factors, including climatic variability, differences in local and areawide geology, antecedent moisture content of the soil, riverflow conditions, and the character and availability of surface and channel sediment prior to the event.

For the purpose of this investigation, simplifying assumptions were made to develop estimated 100-year sediment production rates. Estimated rates were generated by assuming that the average annual sediment production could be multiplied by a factor obtained from comparing expected magnitudes for single-storm erosion indexes with the average annual erosion index. Agriculture Handbook No. 537 (USDA, SEA, 1978) lists several expected single-storm erosion indexes that were computed for storm conditions that are likely to be exceeded once in 1-, 2-, 5-, 10-, and 20-year periods. An exceedence frequency curve was developed using the values listed in Tables 17 and 18 in AH No. 537 (USDA, SEA, 1978), then the 100-year ratio of the 100-year value to the average annual erosion index provided a multiplication factor of approximately 12.3. This factor was used to multiply the average annual sediment production rates to produce estimated 100-year storm sediment productions of 1.51×10^6 tons and 1.26×10^6 cubic yards total load in the Truckee River passing the Vista gage.

c. Estimation of Sediment Deposition Potential in the Reno and Truckee Meadows Areas. - Based on the soil types within the watershed, it is estimated that the materials delivered to the Reno and the Truckee Meadows areas will be composed of approximately 2 percent gravel, 48 percent sand, 33 percent silts, and 17 percent clays. Based on these estimated grain size distributions, the potential total average annual amount of sediment available for deposition in the project area would be approximately 50 percent of the total production. Therefore, Reno could average as much as 50,000 tons (43,500 cubic yards) of sediment deposits per year. Truckee Meadows could receive 61,400 tons (51,300 cubic yards) of sediment per year. This estimate assumes that silts and clays will move through the area without depositing. Using the same material distribution and assumptions, the potential 100-year flood deposit is 755,000 tons (630,000 cubic yards) in the Truckee Meadows area and approximately 615,000 tons (536,000 cubic yards) in Reno.

3. Conclusions.

- The section of the Truckee River through downtown Reno is slowly aggrading.
- The estimated total average annual sediment production from Lake Tahoe to Vista is 102,700 cubic yards per year, or 122,700 tons per year.
- The basinwide weighted average sediment yield is approximately 0.1 acre-feet per square mile per year (includes only those watersheds above Vista).
- The estimated sediment production from Lake Tahoe to Vista is 1.26×10^6 cubic yards for the 100-year flood event, or 1.5×10^6 tons.
- Approximately 51,300 cubic yards (61,400 tons) could be deposited in the Truckee River near the Truckee Meadows each year during average flow conditions. The 100-year event may deposit as much as 630,000 cubic yards, or 755,000 tons along the same area.
- Based on currently observed preproject conditions, there appear to be no major sediment related problems along the Truckee River from Verdi to Vista.

D. BASIS OF RECREATION AND FISH AND WILDLIFE USE, AND BENEFITS

1. General.

The procedures described in the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies were followed to estimate use and benefits. A site specific analysis was made using mathematical models described in the U.S. Army Corps of Engineers, Sacramento District Report entitled Analysis of Supply and Demand of Urban Oriented Non-Reservoir Recreation. The models were used to predict recreation use and benefits in a travel cost analysis. The travel cost analysis consists of deriving a demand curve by using the

variable costs of travel to and from a site and the value of time as proxies for price. Three models were used to predict potential use for general recreation, rafting and bicycling. The models were also used to predict how far beyond the distance to the Truckee Meadows recreation sites the recreation participants would be willing to travel to obtain similar recreation experiences. This additional willingness to travel was used as a proxy for average willingness to pay in estimating recreations benefits. Estimates of use for fish and wildlife supplied by other agencies were used in the analysis. For recreation features that did not have information relating recreation use to willingness to travel, use was estimated by analyzing seasonal distribution of use and the capacity of the facilities expected turnover rates. Unit values were applied to these use estimates to estimate recreation benefits. The potential use attributable from the existing facilities was subtracted from the total estimated use in estimating recreation benefits. The analysis of recreation supply and need described in Chapter III-C indicates that the facilities proposed in the plan will fulfill only a small portion of the present needs for fishing access and trails.

2. Study Area.

The geographic resource area was defined as the flood control project area and lands required for access to that area. The extent of the market area, based on the anticipated origin of the majority of users was 33 miles from the Reno-Sparks Metropolitan area.

3. Forecast of Recreation and Fish and Wildlife Use.

Potential use, maximum practical use, and estimated use was calculated from recreation and fish and wildlife use data supplied by other agencies; use estimating models; and the capacity method of estimating use.

The available data on existing use within the Truckee River area was limited and consisted primarily of information from the State Comprehensive Outdoor Recreation Plan and the fishing survey conducted by the Nevada Department of Wildlife. A survey of use at four existing parks along the Truckee River during the late part of summer 1983 was prepared by the Corps. Potential recreation use was estimated by defining a primary day use market area and using the general recreation, bicycling, and rafting/tubing estimating models.

Potential fishing use was based on data from Fish and Wildlife Service. Nonconsumptive use was estimated by the capacity method.

4. Determination of Without-Project Condition.

Recreation use without the project was estimated to be 1,800,000 recreation days based on the survey conducted in 1983. From FWS estimates, fishing use without the project is estimated to be from 61,000 to 65,000 angler days in that part of the project area influencing angler use.

E. BASIS OF ECONOMIC ANALYSIS

1. Flood Plain Inventory.

a. Flood Plain Reaches. - For purposes of economic analysis, the flood plains within the study area have been divided into the 17 reaches shown on Figure 6. Each reach displays various physical and economic characteristics, such as land use, depth of flooding, etc., which distinguish it from the others.

Reach 1 consists mainly of narrow strips of farmland which are adjacent to the Truckee River. Presently there is some urban development such as apartments and condominiums, and additional development is projected.

Reach 2 is in the dense urban development of downtown Reno. This area is recognized as the central business district and has experienced severe flood damages in the past. Virginia Street, a densely commercial street, runs through "downtown" Reno, and is lined on both sides by casinos and hotels such as Harrah's and Harold's Club.

Notable properties within Reach 2A include the Reno City Police Department, the Reno Gazette-Journal, and the Libby Booth Elementary School. This portion of the flood plain will experience a sheet flow of water flowing back into the river from two areas where it overflows the banks, one near Center and Lake Streets and the other in the vicinity of Ryland Street.

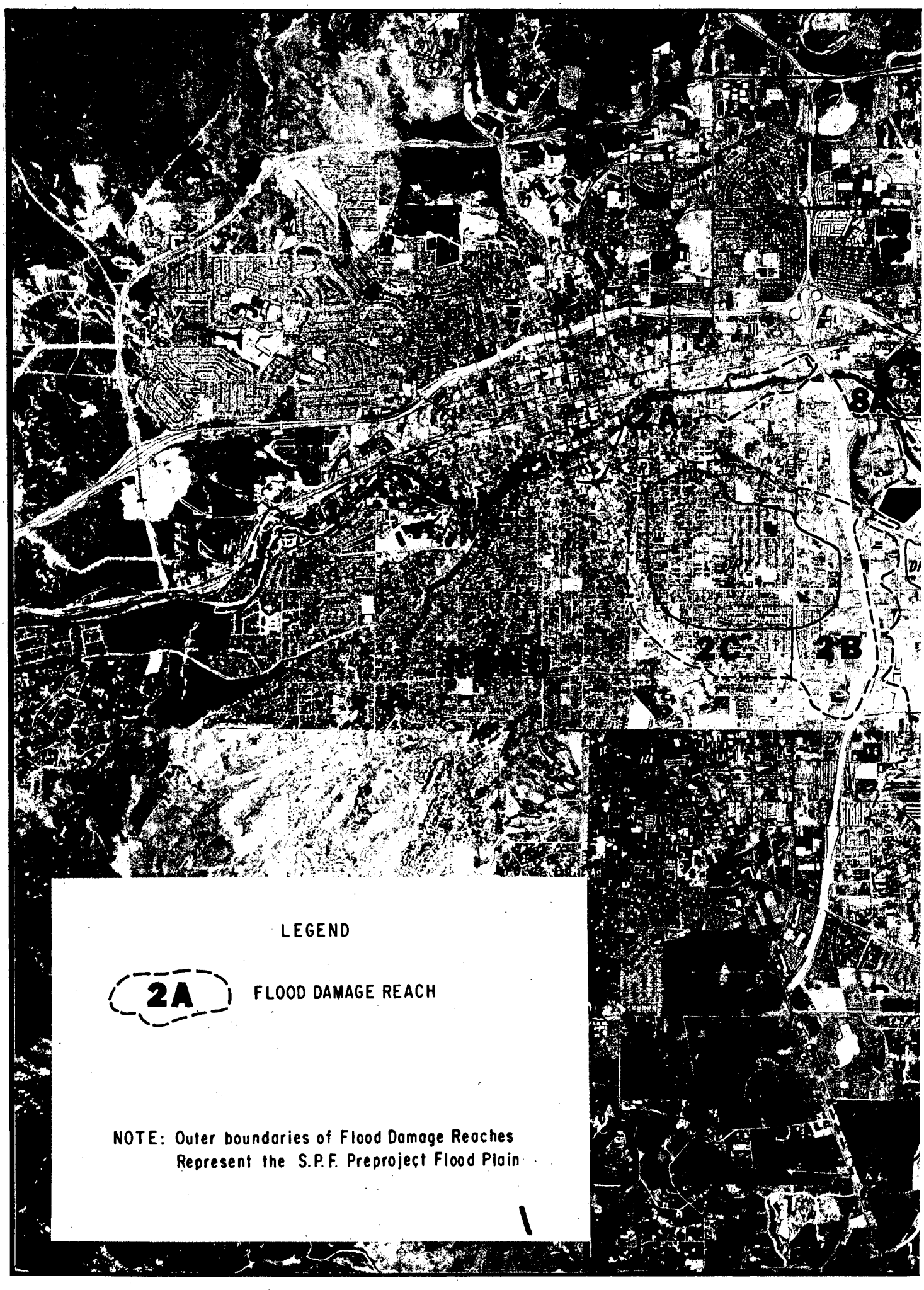
Reach 2B is an area which would receive infrequent flooding. Residential areas, as well as public facilities such as the U.S. Post Office and the Earl Wooster High School and Roger Corbett Elementary School, are found in this reach. Also located within this reach are such commercial properties as automobile dealerships, motels, and a large shopping center.

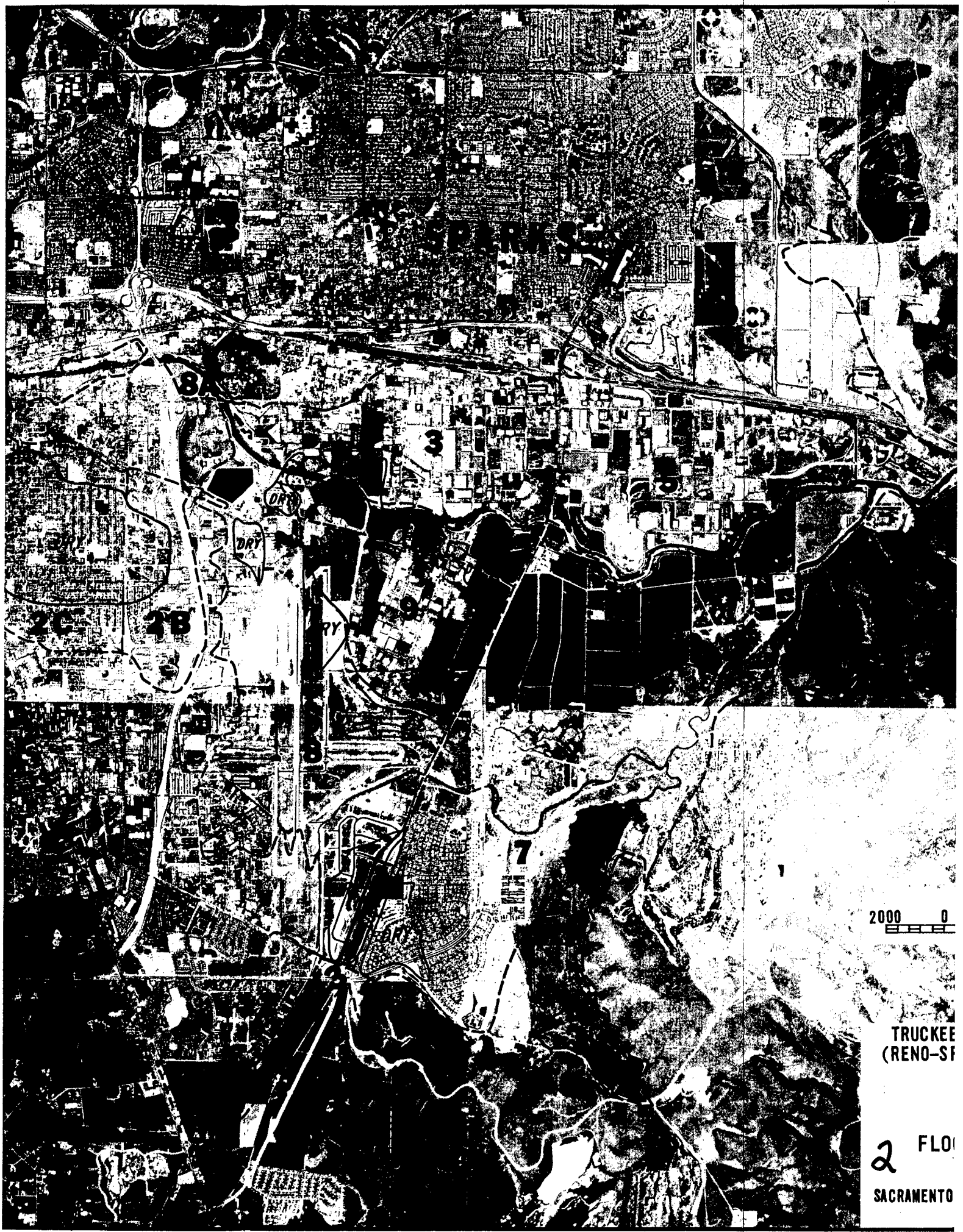
Along South Virginia Street and Holcomb Avenue in Reach 2C, primarily commercial properties dominate the landscape. Automobile dealerships, restaurants, department stores, and grocery stores are common businesses in this area. In other parts of the reach, older single-family residences and multiple residences are interspersed with some public and semipublic properties.

Reach 3 is primarily within the City of Sparks, and is one of the most rapidly developing industrial areas in Truckee Meadows. Both ponding and sheet flow are commonly experienced during flooding. This reach is comprised of a variety of commercial properties with the exception of a recreational vehicle trailer park.

Reach 4 is rapidly changing from a rural agricultural area to an industrial complex, with miscellaneous wholesale and warehouse establishments. Located within this reach are Western Union Telegraph and the Brothers of the Holy Rosary Monastery.

Another reach primarily located within the city of Sparks is Reach 5. At one time this reach was predominantly a rural cropland area; land use projections indicate complete industrial development by project year one. The 1.6 million square foot Pacific States Regional Warehouse of K-Mart is within this reach.


2A
2C
2B
LEGEND
2A
FLOOD DAMAGE REACH
NOTE: Outer boundaries of Flood Damage Reaches
Represent the S.P.F. Preproject Flood Plain


8
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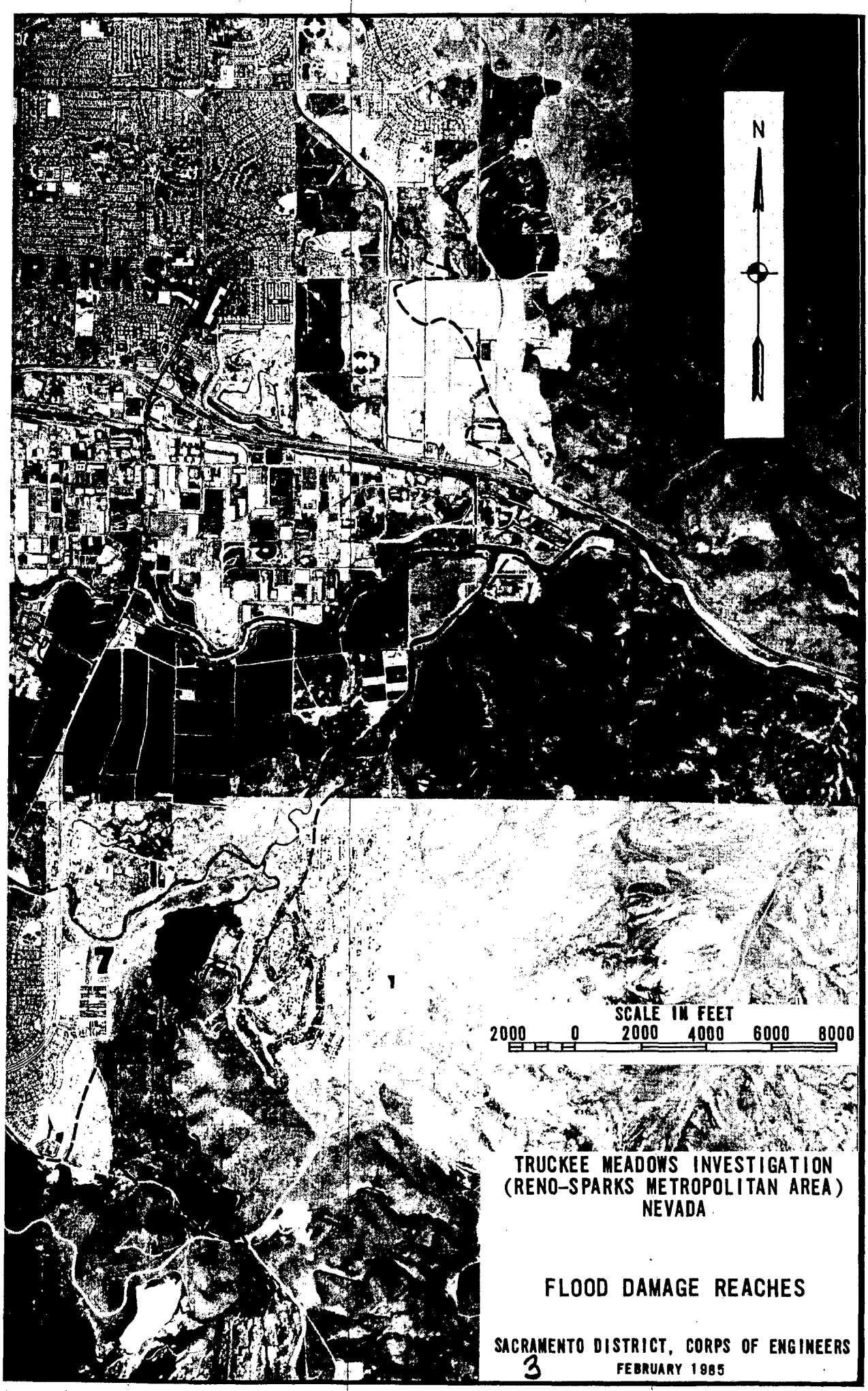
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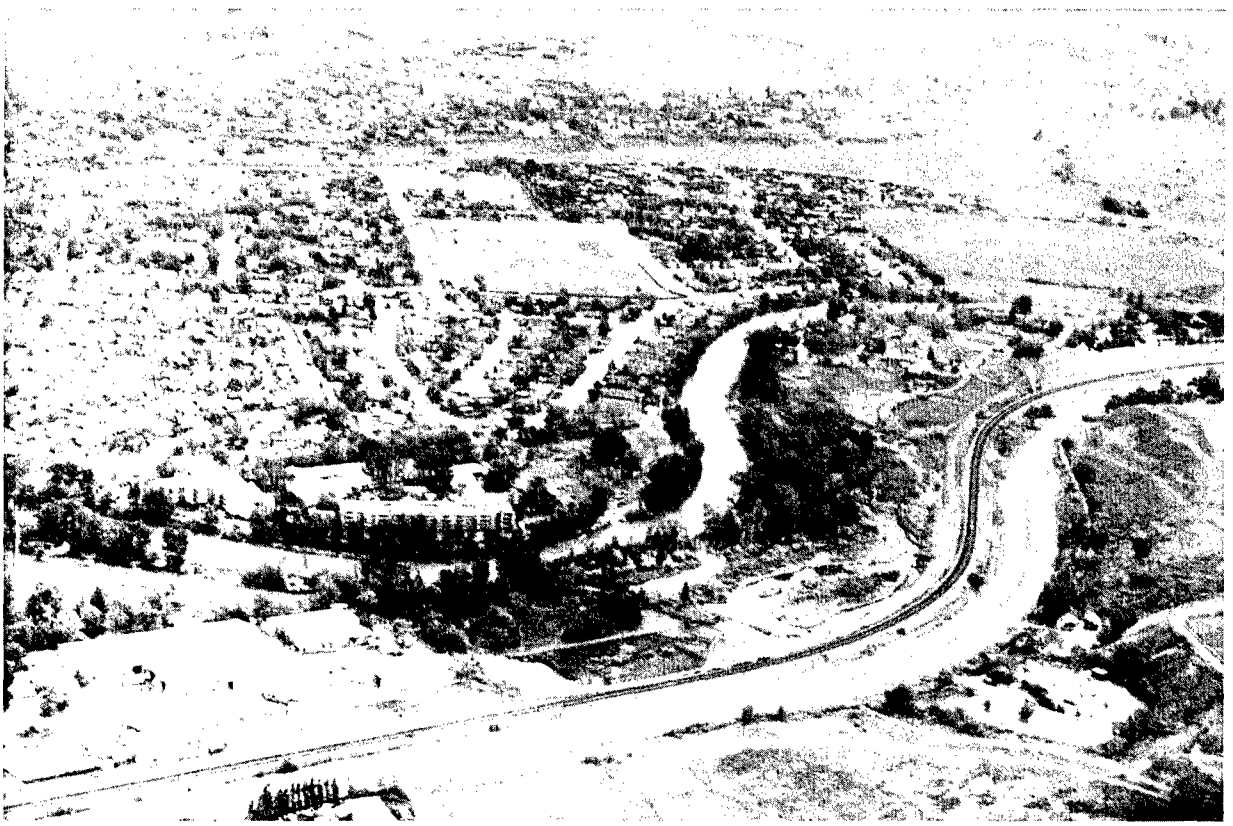
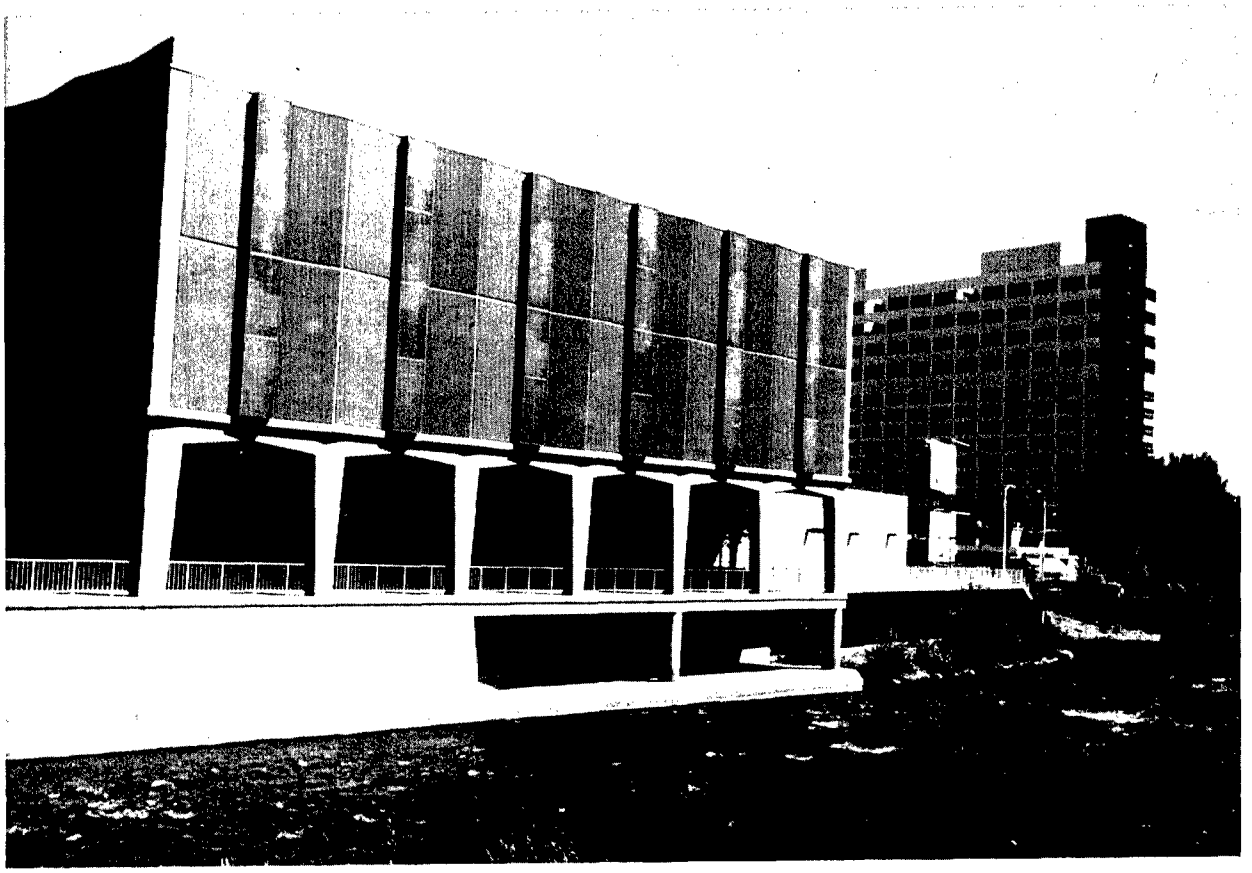
SCALE IN FEET
2000 0 2000 4000 6000 8000
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
FLOOD DAMAGE REACHES
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 6

Apartment complex located in damage reach 1.



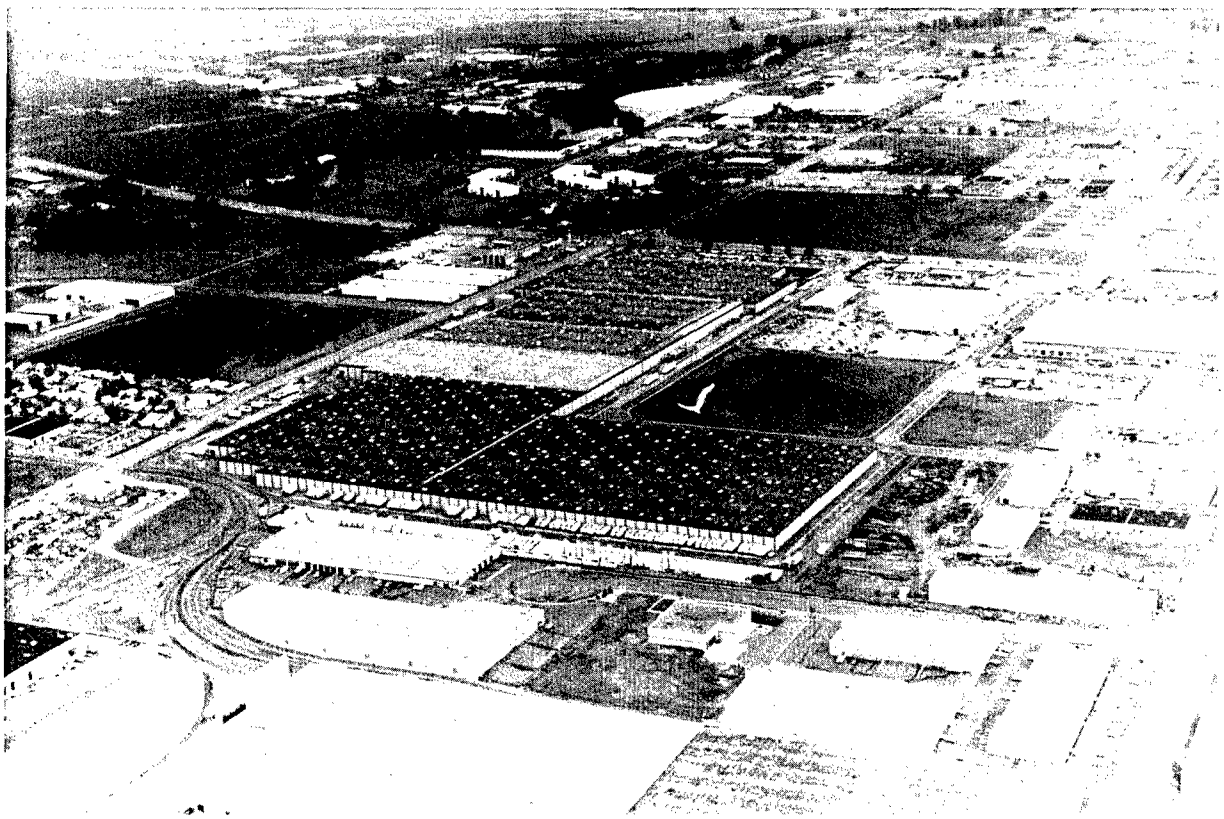
Development along the Truckee River in damage reach 1.



Nevada Bell building along the north bank of the Truckee River between Center and Lake Streets.

View of downtown Reno looking south.

View of the industrial warehouse area in damage reach 5.



L-shaped building shown here is the K-Mart warehouse located in the Meadows area. It has 1.6 million square feet of space and an inventory which varies from $80 to $300 million throughout the year.

Reach 6 is dominated by the University of Nevada Agricultural Experiment Station.

Reach 7 has grown rapidly in the last 5 years. Current developments include Donner Springs subdivision and Hidden Valley Estates.

Reach 6 remains predominantly an agricultural area and comprises the land owned and operated by the Agricultural Experiment Station of the University of Nevada (UNAES). Crops in this reach are mainly forage related. Although the future land use is projected to remain agricultural, it remains to be seen if this area will also yield to developmental pressures being felt in other reaches within the flood plain. In the past this area was known as Vista Lake because of the resultant ponding during floods.

Reach 7 was once predominantly agricultural land. This area has grown rapidly in the last 5 years, and there is additional pressure to further develop the remaining lands, with the exception of the wetlands. Current residential developments include Donner Springs subdivisions, Hidden Valley Estates and golf course development, and miscellaneous condominiums and mobile home complexes. Flood problems in this reach are aggravated by flows from Steamboat Creek and Boynton Slough. As this area is developed, drainage systems are being developed which may completely change the ecosystem of the area.

Reach 8 has been broken into two subreaches for purposes of this analysis. The principal occupant of Subreach 8 is the Cannon International Airport, which has experienced substantial flooding from historical events. Also located within subreach 8 are commercial properties, low density residential units, and the public facilities of the Reno Municipal Golf Course, the Reno Animal Shelter, and Washoe County's maintenance yard.

Subreach 8A is a small area located south of the Truckee River. The most notable structure in this subreach is occupied by a State of Nevada office building.

Reach 9 is developing industrially, as noted by the many businesses and warehouses, such as Sierra Pacific Power, Hexcel Sports, National Cash Register, and Pepsi-Cola Bottling Company, which all have facilities in the area.

Currently, the two major occupants of Reach 10 are General Motors Parts Plant and B. F. Goodrich. Also located within Reach 10 is a large gravel operation which would serve as a natural reservoir in times of extreme flooding.

Reach 11 is primarily an agricultural area; alfalfa is the major crop. Native vegetation also supports some range cattle.

Reaches 12 and 13 also experience infrequent flooding from the Truckee River. There is a mixture of residential properties in these reaches. Meadowwood Mall, a large shopping center on the western border of Reach 12, serves this area.

b. Land Use in the Flood Plain. - The measurement and projection of damages resulting from inundation are based upon relationships between present and future land use characteristics and the vulnerability of properties within the flood hazard area to damages. Existing and future land use acreages for individual categories in the defined 100-year and standard project flood plain are shown on Tables 12A-C. Acreage totals between the

TABLE 12-A
EXISTING AND FUTURE LAND
USE IN THE 100-YEAR FLOOD PLAIN BY REACH
(ACRES)

REACH	YEAR	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	PUBLIC/ SEMI-PUBLIC	AGRICULTURE
1	1982	4	--	--	--	63
	1990	4	--	--	--	63
2	1982	55	12	--	44	35
	1990	55	12	--	44	35
2A	1982	--	--	--	--	--
	1990	--	--	--	--	--
2B	1982	--	--	--	--	--
	1990	--	--	--	--	--
2C	1982	--	--	--	--	--
	1990	--	--	--	--	--
3	1982	8	46	439	70	35
	1990	8	49	458	70	14
4	1982	--	--	11	8	53
	1990	--	--	43	12	17
5	1982	17	35	340	68	700
	1990	0	87	906	68	89
6	1982	10	--	--	952	100
	1990	10	--	--	952	100
7	1982	27	--	--	36	1011
	1990	57	--	--	46	968
8	1982	6	23	--	102	23
	1990	6	23	--	102	23
8A	1982	--	--	3	6	23
	1990	--	--	10	6	16
9	1982	--	3	32	9	170
	1990	--	3	157	44	10
10	1982	--	--	--	--	--
	1990	--	--	--	--	--
11	1982	--	--	--	--	140
	1990	90	--	--	40	22
TOTAL	1982	127	119	825	1295	2353
	1990	230	174	1574	1384	1357

TABLE 12-B
EXISTING AND FUTURE LAND USE
IN THE STANDARD PROJECT FLOOD PLAIN BY REACH
(ACRES)

REACH	YEAR	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	PUBLIC/ SEMI-PUBLIC	AGRICULTURE
1	1982	23	7	--	4	74
	1990	27	7	--	4	75
2	1982	94	86	--	95	34
	1990	94	86	--	95	34
2A	1982	47	53	12	39	5
	1990	47	57	12	39	1
2B	1982	37	45	--	96	84
	1990	37	121	--	96	5
2C	1982	87	53	--	56	--
	1990	87	53	--	56	--
3	1982	12	79	505	98	109
	1990	6	91	590	98	12
4	1982	2	3	16	10	70
	1990	2	3	61	16	17
5	1982	8	32	340	68	720
	1990	0	84	906	68	81
6	1982	6	--	--	986	100
	1990	6	--	--	986	100
7	1982	389	2	--	161	1055
	1990	418	2	--	179	1092
8	1982	64	70	44	926	46
	1990	64	70	44	926	46
8A	1982	--	2	4	6	25
	1990	--	2	11	6	19
9	1982	7	2	86	50	355
	1990	7	2	332	133	8
10	1982	140	55	170	111	784
	1990	308	271	467	177	2
11	1982	--	--	--	--	149
	1990	95	--	--	41	16
TOTAL	1982	916	489	1177	2706	3610
	1990	1198	849	2423	2920	1508

Table 12-C

SUMMARY OF
EXISTING AND FUTURE LAND
USE IN THE 100-YEAR AND SPF
FLOOD PLAINS

DESIGNATION	FLOOD PLAIN	EXISTING[1] LAND USE (ACRES) (1982)	FUTURE LAND USE (ACRES)				
			1990	2000	2010	2030	2040
RESIDENTIAL	100 YR	127	230	230	230	230	230
	SPF	916	1198	1198	1198	1198	1198
COMMERCIAL	100 YR	119	174	174	174	174	174
	SPF	489	849	849	849	849	849
INDUSTRIAL	100 YR	825	1574	1574	1574	1574	1574
	SPF	1177	2423	2423	2423	2423	2423
PUBLIC AND SEMIPUBLIC	100 YR	1295	1384	1384	1384	1384	1384
	SPF	2706	2920	2920	2920	2920	2920
AGRICULTURE[2]	100 YR	2353	1357	1357	1357	1357	1357
	SPF	3610	1508	1508	1508	1508	1508
TOTAL ACREAGE	100 YR	4719	4719	4719	4719	4719	4719
	SPF	8898	8898	8898	8898	8898	8898

1/ 1982 conditions.
2/ Includes vacant native vegetation, fallow field, and stream channel.

SOURCE: Based upon aerial photographs, city and county assessors' rolls, the general development plans for the City of Sparks, the City of Reno, and Washoe County, local and regional population projections, direct interviews, and field survey.

five land use designations are projected to remain constant based upon current zoning laws and regulations. Total acreage within the standard flood plain is approximately 8,900 acres.

c. Physical Units. - Existing units within the SPF flood plain total 5,400; Table 13 shows the breakdown of this figure by major land use category. Residential units comprise the largest portion of the total, or approximately 82 percent. Commercial and industrial units comprise 11 and 5 percent, respectively.

d. Value of Property. - The market value of damageable property occupying the standard project flood plain, excluding lands, roads, utilities, and bridges, was estimated to be slightly in excess of $2.7 billion in 1982. Table 14 indicates that industrial and commercial properties contribute the highest values to this total - 42 percent and 31 percent, respectively. The property values reflect not only the structure value but also inventory on hand, fixtures, and equipment. Currently about 19 percent of the total flood plain value is contained in the residential categories: structure and contents. Multiple residential comprises the largest portion of this percentage followed closely by single-family homes. The last category, public facilities, contributes the final 8 percent of the total flood plain value.

2. Flood Damages.

Based on data presented in the preceding paragraphs, flood damages were computed by determining relationships between damages and depths, flows, and frequencies of flooding. The following will discuss these relationships at greater length.

a. Types of Damages. - Principal types of flood damages are those physical damages which are caused by inundation or flood emergency costs. Physical damages include damages to, or loss of, buildings and their contents, (including furnishings, equipment, and fixtures), raw materials, goods in process, and finished products awaiting distribution. Other physical losses considered are damages to lot improvements such as cleanup, and damages to roads, bridges, and utilities.

Additional costs are incurred during flood emergencies for evacuation and reoccupation, flood fighting, disaster relief, and extra duty for police, fire, and military units. Intangible damages such as loss of life, impairment of health and living conditions, and other conditions that cannot be evaluated in monetary terms have not been included in the damage analysis.

b. Methodology. - Essentially, three steps were used in estimating flood damages which would occur in future years: first, the number and size of the physical units were estimated; secondly, the existing and future values of units were established; and finally, the damage susceptibility of those units was determined. By means of field surveys, aerial photography, and analysis of available data, the number and size of physical units in the flood plain were determined by hazard zones (25-, 50-, 100-, and SPF events) for each of the following categories: residential, commercial, industrial, public and semipublic facilities, and agriculture.

Table 13

EXISTING AND FUTURE
DAMAGEABLE UNITS IN THE
100-YEAR AND SPF FLOOD PLAINS

DESIGNATION	FLOOD PLAIN	EXISTING LAND USE (1982)	FUTURE LAND USE				
			1990	2000	2010	2030	2040
RESIDENTIAL	100 YR	356	742	742	742	742	742
	SPF	4425	5971	5971	5971	5971	5971
COMMERCIAL	100 YR	167	225	225	225	225	225
	SPF	613	802	802	802	802	802
INDUSTRIAL	100 YR	170	392	392	392	392	392
	SPF	244	574	574	574	574	574
PUBLIC AND SEMIPUBLIC[1/]	100 YR	54	54	54	54	54	54
	SPF	115	115	115	115	115	115
TOTAL UNITS	100 YR	747	1413	1413	1413	1413	1413
	SPF	5397	7462	7462	7462	7462	7462

1/ Growth of public facilities not projected for flood plain since majority of existing structures currently have new construction of support facilities outside of flood plain due to cost and availability of land.

SOURCE: Based on aerial photographs, city and county assessors' rolls, the general development plans for the City of Sparks, the City of Reno, and Washoe County, local and regional population projections, direct interviews, and field survey.

Table 14

DAMAGEABLE PROPERY
VALUES IN THE 100-YEAR AND
SPF FLOOD PLAINS 1/ 2/
(THOUSANDS OF DOLLARS)

TYPE OF STRUCTURE	FLOOD PLAIN	VALUE
Residential	100 YR	22,610
	SPF	532,540
Commercial	100 YR	267,780
	SPF	838,130
Industrial	100 YR	812,940
	SPF	1,159,000
Public and Semi-Public	100 YR	24,240
	SPF	211,810
TOTAL	100 YR	1,127,570
	SPF	2,741,480

1/ October 1984 Prices, 1982 Conditions.

2/ Excludes lands, roads, bridges, utilities, and railroads.

c. Depth-Damage Relationships. - Depth-damage relationships describe the probable damages that will occur under different depths of flooding conditions, either as a percentage of the total value of damageable property or in the probable loss expected. The depth-damage relationships used in this analysis were derived from historical data when available. Otherwise this information was obtained from relationships established by insurance companies, other Corps districts, direct interviews, or projects with similar physical characteristics. These relationships were developed for individual land use categories and are dependent upon the type, age and condition of the structures, foundation heights, and the localized characteristics of the terrain. Other factors considered in the flood damage analysis were velocity, duration, and debris content of floodwaters.

d. Damage-Flow Relationships. - Damage-flow relationships describe the probable flood damages expected for various streamflows. They are derived by estimating the probable flood damages of several hypothetical floods of given streamflows. The probable flood damages that would result from a particular flow are estimated by describing the flood plain area associated with that flow, inventorying this area by damage category and depth of flooding, and applying the appropriate depth-damage relationships for each damage category. Probable damages were determined for the 25-year, 50-year, 100-year, and SPF flood events. Intermediate damage points are interpolated from these estimates on the basis of proportionate changes in the magnitude of streamflows.

e. Average Annual Damages. - Average annual damages are the expected value of damages for a given economic condition and point in time. They are determined by weighing the estimated damages from varying degrees of flooding by their probability of occurrence and may be approximated by measuring the area under the damage-frequency curve using standard mathematical integration procedures.

Probable average annual damages without the proposed project were estimated for the present year, the base year (1990), and annually throughout the study period. Average annual equivalent damages, presented in Table 15, for the period 1990-2040 were estimated on the basis of a 8-3/8 percent discount rate, October 1984 prices, and standard discounting procedures.

Table 15

AVERAGE ANNUAL EQUIVALENT
WITHOUT PROJECT DAMAGES
(8-3/8 PERCENT DISCOUNT RATE: 1990-2040 PROJECT LIFE:
1 OCTOBER 1984 PRICE LEVELS)

REACH NO.		FLOOD DAMAGES ($1,000)
1		62
2		1,454
2A		168
2B		413
2C		141
3		799
4		131
5		11,049
6		28
7		1,901
8		325
8A		57
9		1,859
10		4,744
11		95
12		17
13		6
	TOTAL	23,249

SUMMARY OF AVERAGE ANNUAL EQUIVALENT
WITHOUT PROJECT DAMAGES

ITEM		FLOOD DAMAGES ($1,000)
Residential		2,886
Commercial		3,570
Industrial		15,452
Public and SemiPublic		1,218
Emergency Costs		123
Agriculture		Negligible
	TOTAL	23,249

CHAPTER V

PLAN FORMULATION

Plan formulation is a creative and analytical process which involves (1) establishing objectives, (2) delineating specific criteria, (3) identifying management measures, and (4) formulating alternative plans. Plan formulation will be discussed in this chapter.

A. PLANNING OBJECTIVES

The objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services. Water and related land resources project plans are formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective.

The following planning objectives were established to address the problems and realize the opportunities identified in the Reno-Sparks Truckee Meadows area and to serve as guidelines for the formulation and evaluation of alternative plans.

1. Reduce flood damages to the Reno-Sparks Truckee Meadows area to protect economic development and environmental resources.

2. Enhance recreation opportunities in the Reno-Sparks Truckee Meadows area by increasing public access and recreation facilities.

3. Protect and enhance fish and wildlife habitat along the Truckee River and tributaries in the Reno-Sparks Truckee Meadows area.

4. Preserve scenic values along the Truckee River and tributaries, such as existing parks, cultural areas, archeological sites, and riparian vegetation.

B. FORMULATION AND EVALUATION CRITERIA

Water and related land resource plans are to be formulated to alleviate problems and take advantage of opportunities that occur at the national, State, and local levels in ways that contribute to the NED objectives. The additional consideration of environmental quality (EQ), regional economic development (RED), and other social effects (OSE) are also evaluated. The environmental quality (EQ) account displays nonmonetary effects on significant natural and cultural resources. The regional economic development (RED) account registers changes in the distribution of regional economic activity that results from each alternative plan. The other social effects (OSE) account registers plan effects from perspectives that are relevant to the planning process, but are not reflected in the other three accounts.

Because of their broad nature, these objectives and accounts have been redefined in terms of criteria relating to the problems and opportunities being investigated. These criteria provide for an objective and consistent formulation and evaluation of all alternatives.

1. Technical Criteria.

a. Flood Control. -

- o Plans should be consistent with Reno, Sparks, and Washoe County general plans, including the Truckee River Corridor Development Plan and Reno Redevelopment Plan.
- o Plans should include provisions for drainage of lands adjacent to proposed levees or floodwalls.
- o Should be consistent with provisions of the National Flood Insurance Program.
- o A high degree of flood protection should be considered due to the high concentration of urban development.
- o Where channel enlargement is necessary, widening of the channel should be limited, if possible, to one side to avoid disruption of natural features.
- o The plan selected should not worsen conditions for floods exceeding project design, without measures to compensate for the effects.
- o The plan selected should not worsen the flood hazard for downstream developments, without measures to compensate for the effects.

b. Recreation. -

- o Recreation plans should complement State and local plans.
- o Recreation plans should be compatible with other recreational developments in the study area.
- o Recreation facilities should be planned to utilize the potential of the resources within the lands required for flood control and other project purposes.
- o Recreation plans should be compatible with and supported by non-Federal interests for sharing project costs and assuming operation and maintenance responsibilities.
- o Plans should be compatible with the flood control, water quality, fish and wildlife, environmental, and other objectives.

2. Economic Criteria.

   - The benefits and costs should be expressed in comparable terms as fully as possible. All evaluations of alternatives should be based on the same price level and the same interest rate, and a project life of at least 50 years.

   - Each alternative considered in detail must be "justified" in the sense that total beneficial effects associated with the objectives are equal to or exceed the total adverse effects associated with the objectives.

   - Project benefits should be based on analysis of conditions without and with a project, using methodology described in "Principles and Guidelines" and Corps of Engineers regulations.

3. Environmental Criteria.

   - Plans should be formulated to preserve and enhance the quality of the natural environment. To the extent practical significant resources, including fish and wildlife, vegetation, land, air, water, open space, and scenic and esthetic values should be preserved and enhanced.

   - Detrimental environmental effects should be avoided where possible, and feasible mitigation for unavoidable effects should be included.

   - The relationship of the proposed action to land use plans should be considered, and the environmental impact of any proposed action should be evaluated. Any adverse environmental effects which can not be avoided, if a proposal were implemented, should be delineated; alternatives to such proposed action should be identified; the relationship between local short-term uses and the maintenance or enhancement of long-term productivity should be determined; and any irreversible and irretrievable commitments of resources involved if a proposed action were implemented should be identified.

   - Consideration should be given to evaluating and preserving historical, archeological, and other cultural resources.

4. Socioeconomic Criteria.

   - Consideration should be given to safety, health, community cohesion, and social well-being.

   - Displacement of people should be minimized to the extent practicable.

- o Improvement of leisure activities and public facilities should be evaluated.

- o Effects of a project on regional development, including income, employment, business and industrial activity, population distribution, and desirable community growth, should be considered.

- o General public acceptance of possible alternative plans should be determined by coordination with interested Federal and non-Federal agencies, various groups, and individuals by means of public meetings, field inspections, informal meetings, letters, and other public involvement procedures.

- o The alternative plans should be workable within the constraints of present and potential governmental structure, function, relationships, and associations in the study area.

C. MANAGEMENT MEASURES

Within the framework of plan formulation criteria, a wide variety of measures were identified to meet the planning objectives for flood control, recreation, and fish and wildlife. Many of the measures were eliminated from further consideration because of limited economic feasibility, significant environmental problems, or limited potential for providing solutions. The measures that were retained provide the basis for formulating alternative plans. A no action measure was considered throughout the planning processes for comparative purposes.

1. No Action Measure.

Under this measure, the Federal Government would take no action to alleviate flood problems. The Truckee River and its adjacent flood plains would not be altered for flood control works. Recreation potential and development would not be assisted by Federal flood control features and associated cost participation. Existing fish and wildlife habitat would be left undisturbed, except when changed by flooding or unrelated processes. This measure will be considered further in order to compare the effect of the alternative plans to conditions expected to occur with no Federal participation, and is synonymous with the without-project condition.

2. Flood Control Measures.

The objective of the flood control measure is to reduce flood damages in the Reno-Sparks Truckee Meadows area.

a. Nonstructural Measures included. -

- o Zoning
- o Flood Emergency Action Programs
- o Flood Proofing

b. Structural measures included. -

- o Improvement of channel capacity
- o Reservoirs
- o Bypass Systems
- o Bridge replacement
- o Construction of detention basin

3. Recreation Measures.

The recreation measures include the following day-use recreation features:

- o Additional bike and pedestrian paths
- o Additional river overlooks and public seating areas
- o Additional fishing/river access and picnic sites

4. Fish and Wildlife Measures.

Fish and wildlife objectives include:

- o Providing improved habitat quality
- o Protection of existing resources from development
- o Increased access to these areas

Fish and wildlife measures considered were. -

- o Mitigation of construction impacts
- o Enhancement area evaluation to benefit fish and wildlife in an urban/rural setting
- o Public access to enhancement areas while protecting the resources of these areas

D. PLANS OF OTHERS

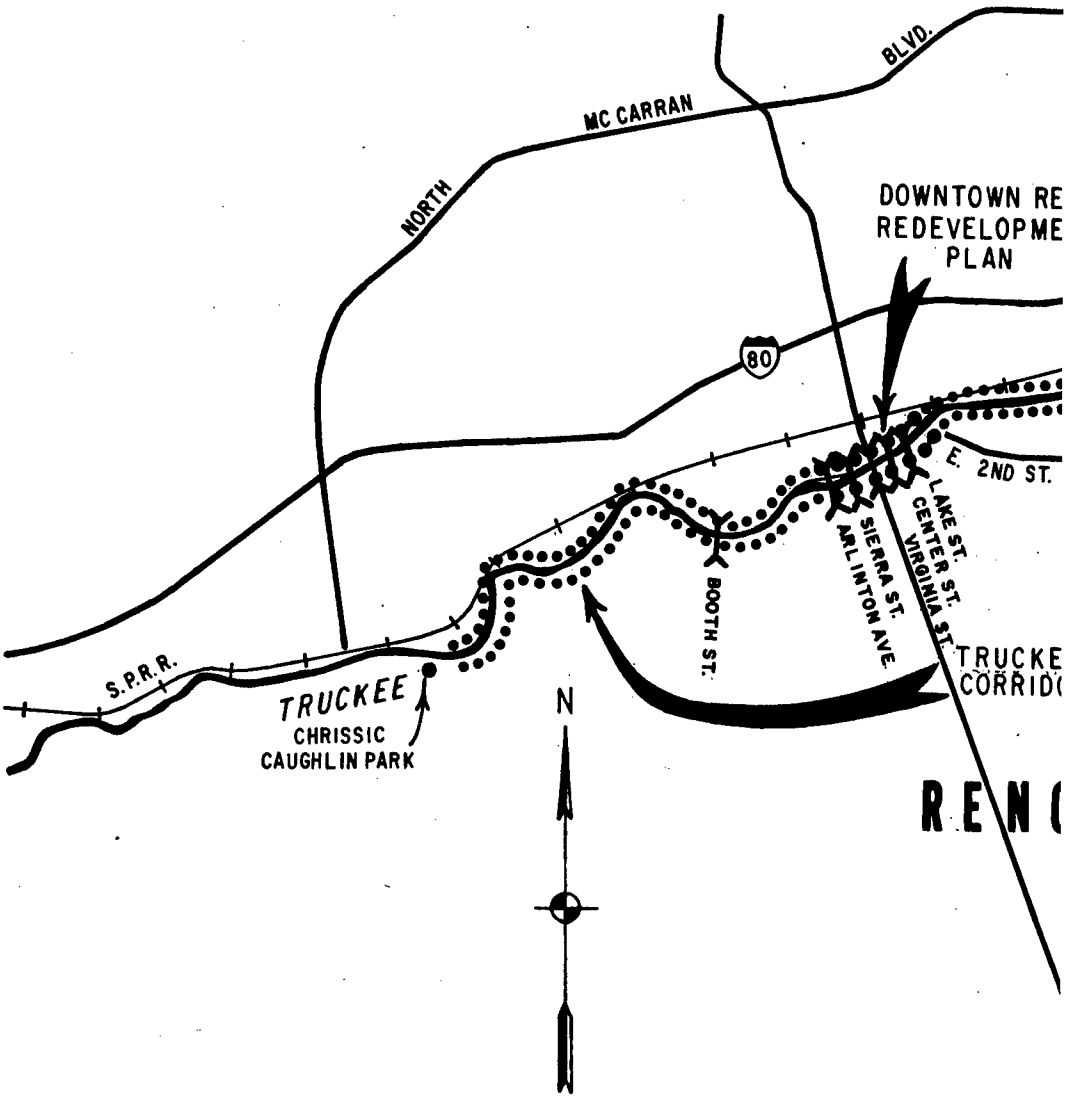
During the preparation of this Feasibility Report, coordination has been maintained with various governmental agencies who are responsible for implementing plans which will either address or impact on the planning objectives of the study area. The following plans in the study area are currently under consideration:

1. Truckee River Corridor Development Plan - City of Reno.

This river beautification plan was endorsed by the City Council and has strong local support. Reno would like to establish a continuous river corridor with a series of river access sites from Crissie Caughlin Park to Arlington Avenue downtown, and from East Second Street to the eastern city limits. (See Figure 7.) The access sites would be connected by landscaped pedestrian/bike paths and bridges.

2. Downtown Reno Redevelopment Plan.

This river beautification plan was also endorsed by the Reno City Council and has strong local support. The plan has been coordinated with the Truckee River Corridor Development Plan. The planning area includes both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SIERRA ST.
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TRUCKE
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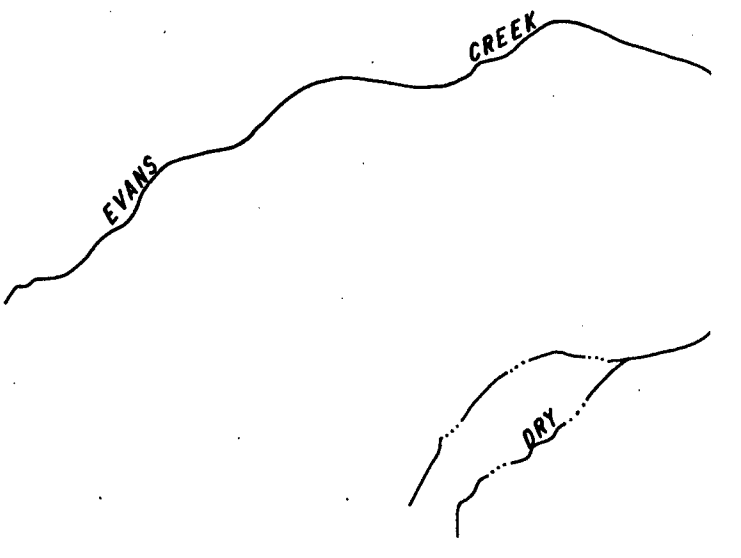
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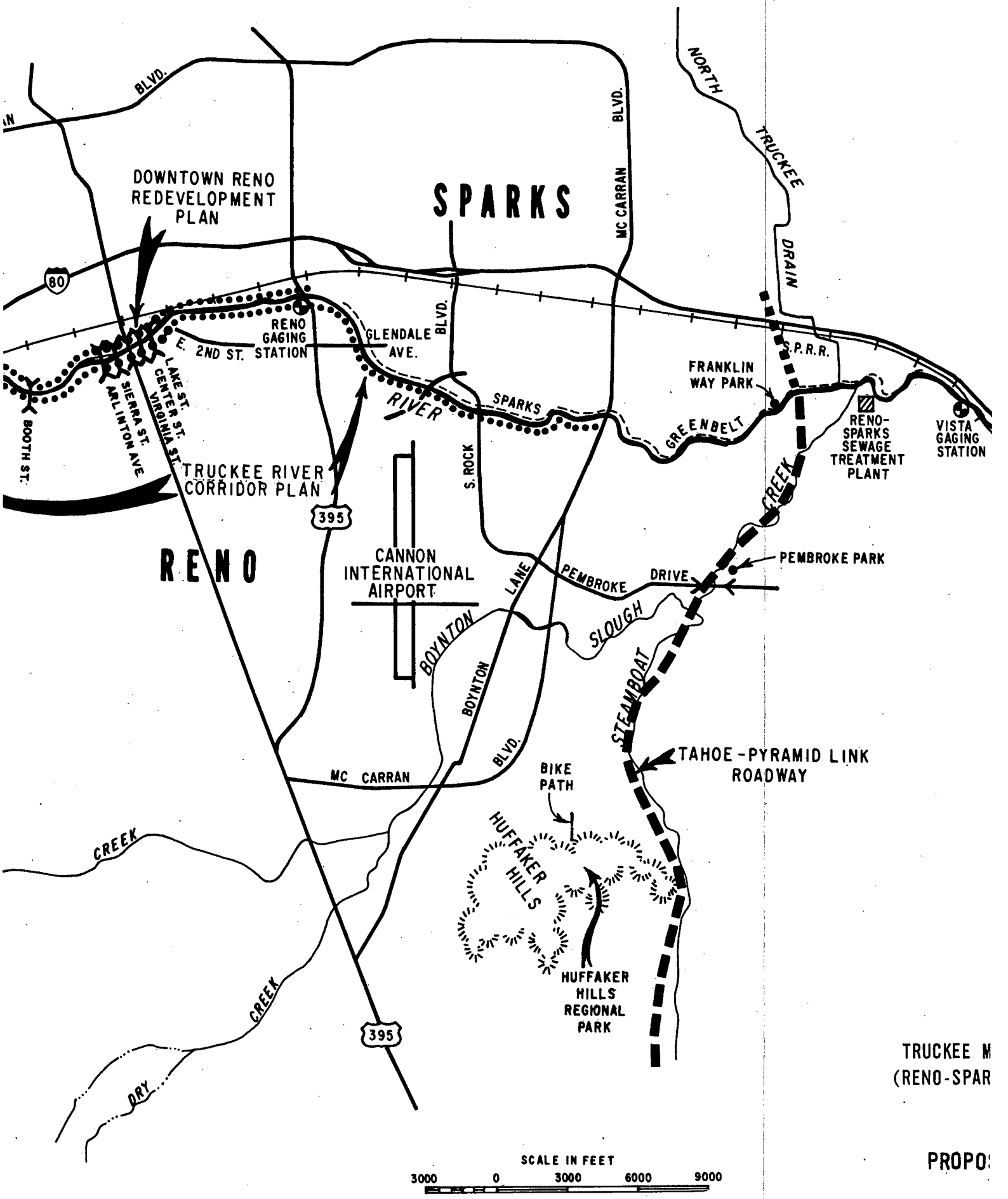

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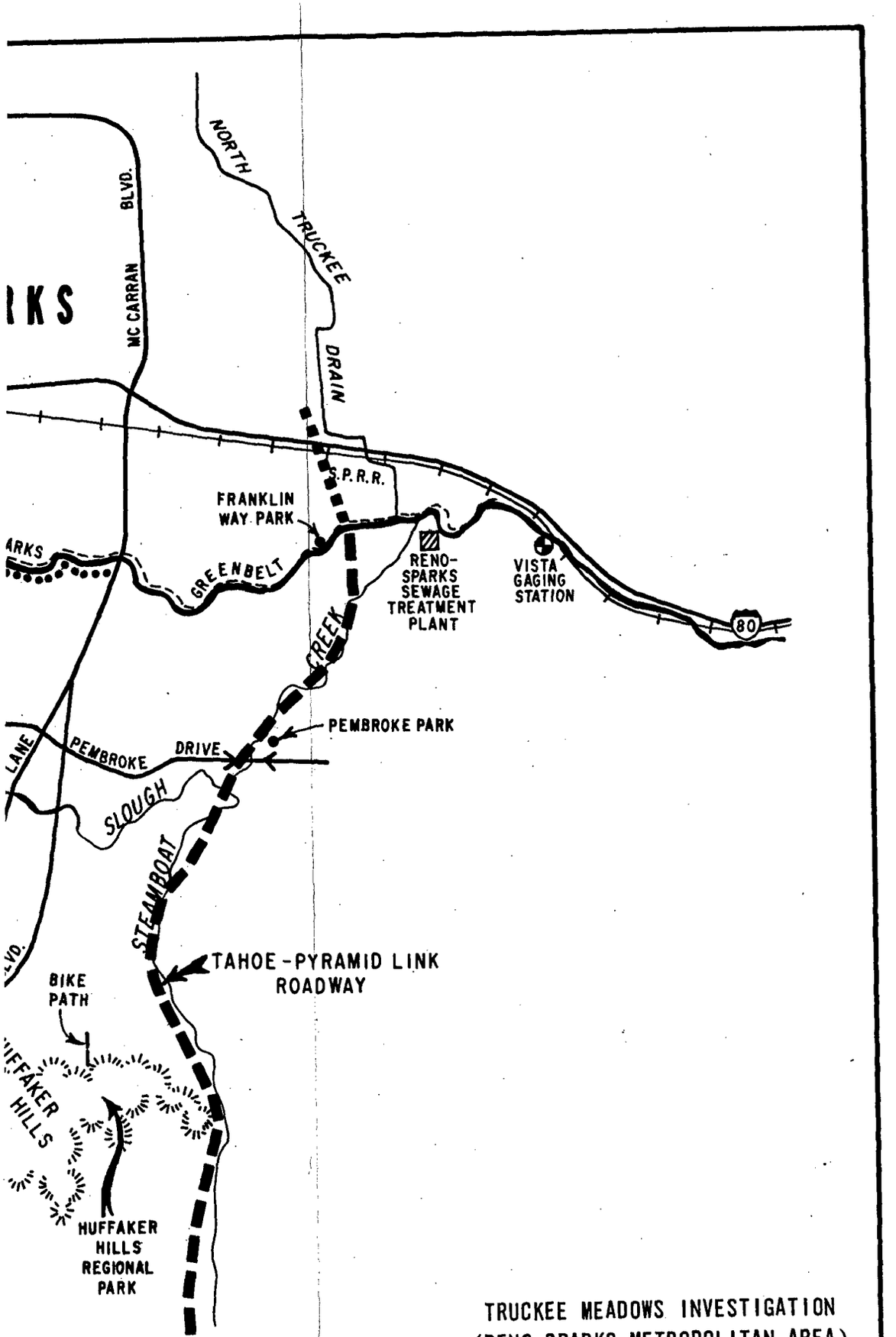


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

PROPOSED LOCAL PLANS

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 7

sides of the river from Arlington Avenue to East Second Street and a portion of Virginia Street. (See Figure 7.) Plans are to improve the riverfront with a system of walkways, river overlooks, public seating areas, retail space, and various esthetic treatments (laser lights, other lights, water screens, reflecting pools, fountains). The city is also considering alternatives for creating a mall on Virginia Street. Working plans are finalized and construction is expected to begin soon.

3. Washoe County Recreation Plans.

The county has plans to construct Pembroke Park near the Pembroke Drive Bridge over Steamboat Creek. The planned Huffaker Hills Regional Park is at the south end of the study area and includes a potential pedestrian/ bicycle path north into Truckee Meadows.

4. City of Sparks Recreation Plan.

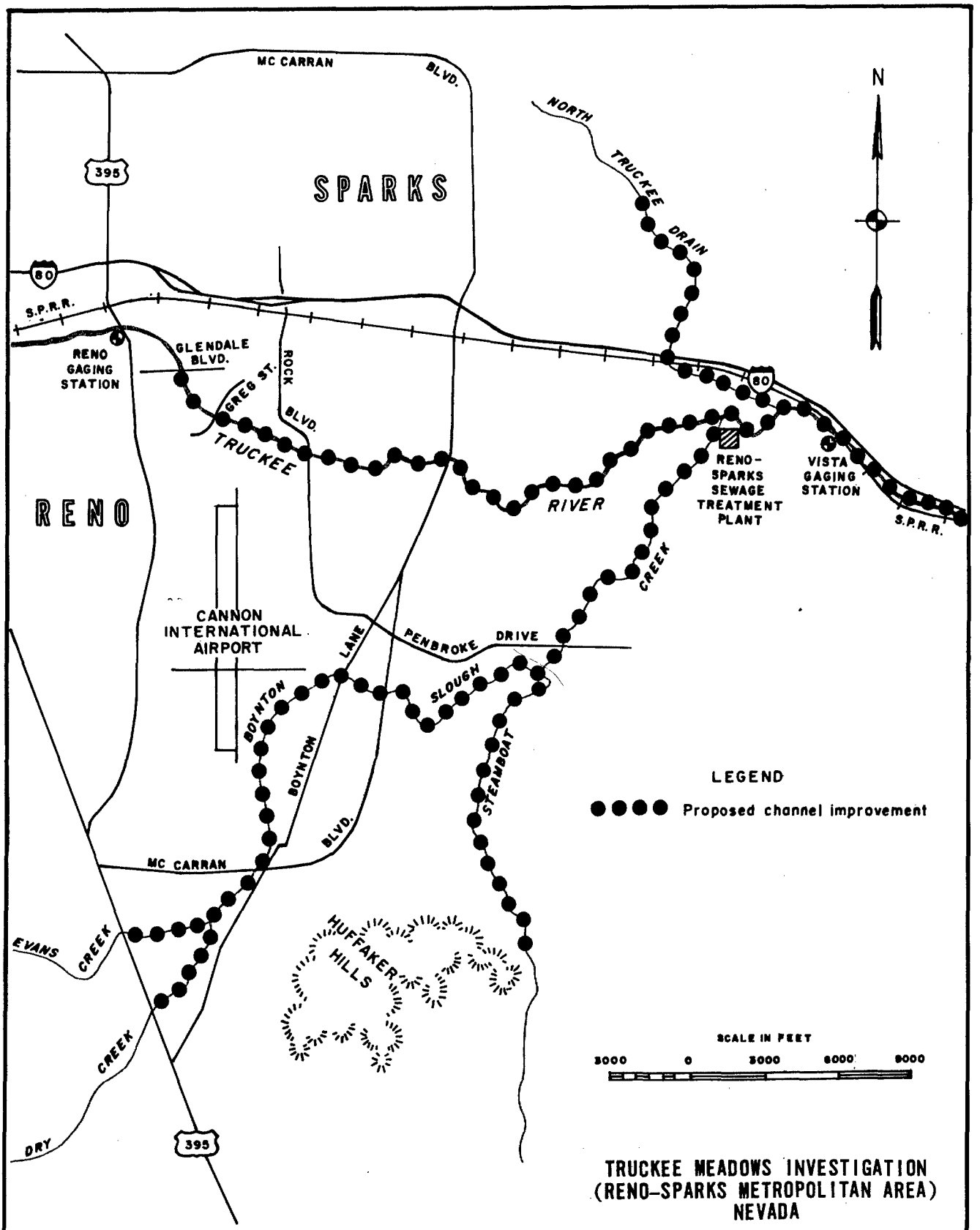
The City of Sparks has developed most of its park system along the Truckee River. Sparks does have plans for a small riverfront park at Franklin Way.

5. Tahoe-Pyramid Link.

The potential development of the southeast Truckee Meadows area and the increasing traffic demand on U.S. Highway 395 has created a need for an additional north/south expressway in the area. The Tahoe/Pyramid Link Highway is proposed to extend from I-80 at the Sparks Boulevard interchange to the Mount Rose Highway intersection with Highway 395, and is shown on Figure 7. This alignment will be generally north and south, passing to the east of the University of Nevada Agricultural Experiment Station and to the west of Hidden Valley through the Bella Vista, Double Diamond, and Damonte Ranches. The alignment study was completed in October 1983 and has been approved by the Regional Transportation Commission, Reno, Sparks, and Washoe County. At this time, no construction schedule has been developed. Any efforts to build the roadway will depend on development pressure along the service area.

6. "Brown Plan" Proposed by Washoe County.

A plan of improvement called the "Brown Plan" was developed by Washoe County in 1973. The plan, as shown on Figure 8, involved enlarging the Truckee River channel through the Truckee Meadows area from Glendale Bridge to Vista Reefs, lowering the reefs in the vicinity of Vista, enlarging the Steamboat Creek channel and other tributary streams, and obtaining flowage easements and miscellaneous improvements downstream from Vista to Pyramid Lake. The plan provided 100-year flood protection to Truckee Meadows between Glendale Bridge and Vista but excluded any added protection to downtown Reno. A copy of the plan was furnished to the Sacramento District for review, and a preliminary determination was made that the plan appeared feasible and would warrant further study. Because of the feasibility of the plan and the strong local support, Sacramento District continued studies on the channel/levee type plan, including added protection to the downtown Reno area.



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

PROPOSED BROWN PLAN

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 8

7. Proposed Small Flood Control Structures by the Soil Conservation Service.

A plan proposed by the Soil Conservation Service (SCS) (Truckee River Basin Survey, 1972) included the construction of flood detention structures on selected streams tributary to the Steamboat-Truckee River system within the Reno-Sparks watershed. Locations of the project sites are shown on Figure 9. The plan as proposed would provide flood protection primarily to rural/agricultural areas upstream of the Truckee Meadows project area. The project was not continued due to lack of local support. Subsequent studies were made to assess the impact of including certain features of the SCS plan as a part of the Truckee Meadows Flood Control Plan. Each detention site was reevaluated in terms of flood control accomplishments and economic feasibility. It was concluded that the SCS detention structures would not significantly reduce the peak flows entering the Truckee Meadows project area. Also, the flood control benefits provided by the SCS plan did not justify the construction costs required. Therefore, the SCS plan was not considered further.

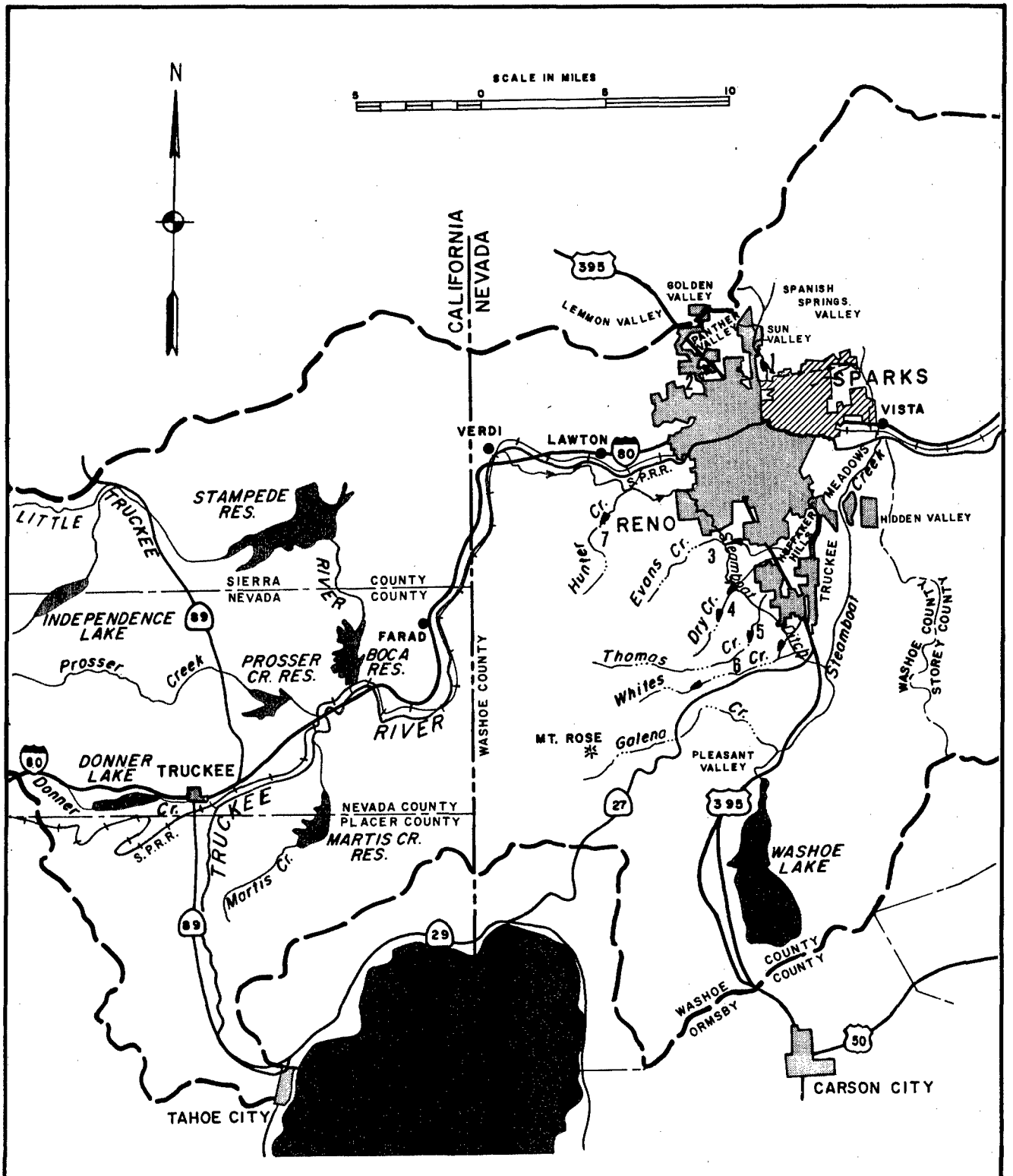
8. Any new development that may affect the implementation of the selected flood control plan will be evaluated during future design studies. All future engineering studies will be based on conditions and local plans prevailing at the time. Therefore, if construction occurs on the Truckee River Corridor Development Plan, Downtown Reno Redevelopment Plan, or the Tahoe-Pyramid Link, modifications can be made to the flood control plan to accommodate these features.

E. DEVELOPMENT OF ALTERNATIVE PLANS

It is impossible to formulate a good plan for flood control in the Truckee Meadows area without first assessing some of the water resource needs and demands in the basin. For example, alternatives that could provide flood control for Truckee Meadows could impact on downstream interests along the Truckee River. Any plan for flood control in the Meadows can not ignore the effects of these downstream interests. Reservoirs on the Truckee River or its tributaries would have to be operated in a manner whereby releases could be made to satisfy the downstream commitments. Channelization of the Truckee River, especially through the reefs near Vista, would increase the potential flood stages downstream.

Other impacts of flood control alternatives would have to be evaluated. Channelization of the tributary streams may drain surrounding lands during dry seasons and could affect irrigation needs, wildlife communities, and the water supply of the community.

Physical conditions in the basin cause problems in formulating flood control alternatives. The reason that the flood plain is so wide and expansive is that a natural reef in the channel near Vista retards outflow of the Truckee River and that the river slope through the Meadows is relatively flat. Downstream of the meadows, the Truckee River flows through a narrow canyon which in times of high flow acts somewhat as a dam. The river through this narrow canyon, often referred to as the Vista reefs, has been widened and deepened in the past. Even so, a considerable backwater effect occurs during high flow. Two tributaries (Steamboat Creek and North Truckee Drain) flow into the Truckee River near the eastern part of the Truckee Meadows.



FLOOD DETENTION SITE LOCATIONS

1 Sun Valley
2 Block "N"
3 Evans Creek
4 Dry Creek
5 Thomas Creek
6 Whites Creek
7 Hunter Creek

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

LOCATION MAP OF
PROPOSED SOIL CONSERVATION
SERVICE FLOOD DETENTION SITES

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 9

For the most part, Truckee Meadows becomes the common flood plain for these tributary streams. In order to achieve a high level of flood protection for the Meadows, the tributaries as well as the Truckee River had to be considered in developing a complete solution.

Another problem associated with potential flood control improvements in Truckee Meadows is that if channel or levee works are constructed to confine floodflows to the Truckee River, peak flows downstream to Pyramid Lake may be increased substantially due to the loss of the natural storage in the overflow basin.

Increasing flood protection through downtown Reno is a major problem because of the intensive development adjacent to the banks of the river. Dense developments exist for about 3 miles along the river in the heart of Reno. This problem has been recognized by the community, and substantial measures have been taken to provide some protection. However, no simple or inexpensive solution is evident for significantly increasing the existing degree of protection.

Any plan to increase the degree of protection on the Truckee River should consider the fishery resources of the river. This is especially important because of the existence of the endangered cui-ui (Chasmistes cujae) and the threatened Lahontan cutthroat trout (Salmo clarki henshawi) and their habitats.

Based on the objectives and criteria previously discussed, the following alternatives were developed.

1. Preproject (No Action) Alternative - Alternative 1.

Under the no action alternative, existing streamflow characteristics or patterns would not be modified, and associated riparian vegetation and wildlife habitat would be left undisturbed, except when changed by flooding or other natural processes or continued development within the Truckee Meadows and lower Truckee River.

"No action" would mean that future storms would cause flooding and related damages. But due to the significant and ongoing development in the flood plain, the dollar damages would be significantly higher than in the past. The cities of Reno and Sparks, and Washoe County are enrolled in the National Flood Insurance Program, which requires that new development be flood proofed to at least the elevation of the 100-year flood. With the no action alternative, significant damages would still occur in the future even with restrictions imposed by the flood insurance program.

2. Nonstructural Alternative - Alternative 2.

A nonstructural plan for flood damage reduction could incorporate zoning regulations, flood emergency action programs, and flood proofing measures.

Zoning and building code regulations are legal measures that could be implemented and enforced, primarily by county and city governments, to effectively reduce the flood damage potential of an area in accordance with a planned program of development and land use. Presently all of the

jurisdictions in the study area are participating in the National Flood Insurance Program, which requires enactment of flood plain regulations to prevent unwise development within the 100-year flood plain (reaches shown on Figure 6). Building codes require that buildings be either constructed of materials which would withstand inundation; elevated above the flood plain by construction of either earth pad, piers, or raised foundations; or provided with perimeter floodwalls. Also, building codes consider means for reducing damages to utilities.

Flood emergency action programs and flood fight plans have been developed for the Truckee Meadows and have proven to be effective in reducing flood damages. It is believed that these emergency programs are adequate for the Meadows area and modifications are not warranted.

The National Oceanic and Atmospheric Administration (NOAA), through its National Weather Service (NWS), maintains year-round surveillance of weather and flood conditions. Daily weather forecasts that apply generally to watershed draining the slopes of Mount Rose are issued by the NWS office in Reno and disseminated by the local news media.

A coordinated plan for flood fighting was developed by Washoe County in cooperation with the cities of Reno and Sparks. In general, the plan provides that the Directors of Public Works supervise flood emergency operations in their respective jurisdictions and that the Civil Defense Agency for Washoe County coordinate activities in the three political entities involved, establish communications, disseminate weather and flood information, and request State and Federal assistance when the flood situation so warrants. During the December 1955 and February 1963 floods, damages were reduced as a result of advanced preparations and flood fight activities. (Total estimated damages of $1,680,000 for the December 1955 flood of record were significantly less than the damages estimated during the earlier 1950 flood.) Although these programs have had an impact on reducing historic flood damages, their effectiveness for future floods is limited. During these earlier events development was primarily located along the downtown Reno area where most of the damages were sustained. Only minor damages occurred to the rural agricultural lands located near lower Truckee Meadows and Sparks. Since that time significant growth, both residential and industrial, has occurred along the lower Truckee Meadows and in the Sparks area. These areas are currently protected by inadequate levees providing approximately 12-year flood protection. If the 1955 flood were to repeat itself today most of the damages would occur downstream of the city of Reno. The nature of flooding along the lower Truckee Meadows is characterized by significant depths and volume, and long durations and flood fight programs would be marginally effective in reducing damages. Significant damages would continue to occur which can only be eliminated by structural measures.

Other nonstructural measures such as flood proofing, permanent evacuation, structure raising, and relocation could be used with some degree of success in the study area. However, due to the nature of flooding, these measures would not be effective. Nonstructural measures such as constructing perimeter walls or elevating structures in most areas of the Meadows would be impractical because of the significant depths of flooding during the 100-year event. Also, many of the buildings within the cities of Reno and Sparks are constructed close to each other, thus preventing construction of walls; and many buildings are multistory, thereby making elevation impractical. In

addition to the numerous physical constraints and probable local objections to proposing such measures, the costs associated with such measures are excessive. Estimated cost to flood proof residential, commercial, and industrial improvements located within the 100-year flood plain with a combination of low floodwalls, levees, and watertight closures would be in excess of $20 million, or approximately $1.7 million on an annual basis. Damages prevented by these measures would be approximately $1.2 million annually which would make this alternative economically infeasible. Also, due to the extremely high value of lands and facilities in the study area, evacuation of existing development would also be infeasible.

3. Structural Alternatives

Various structural alternatives are presented in this section. They include reservoirs, bypass systems, and local channel and levee improvements.

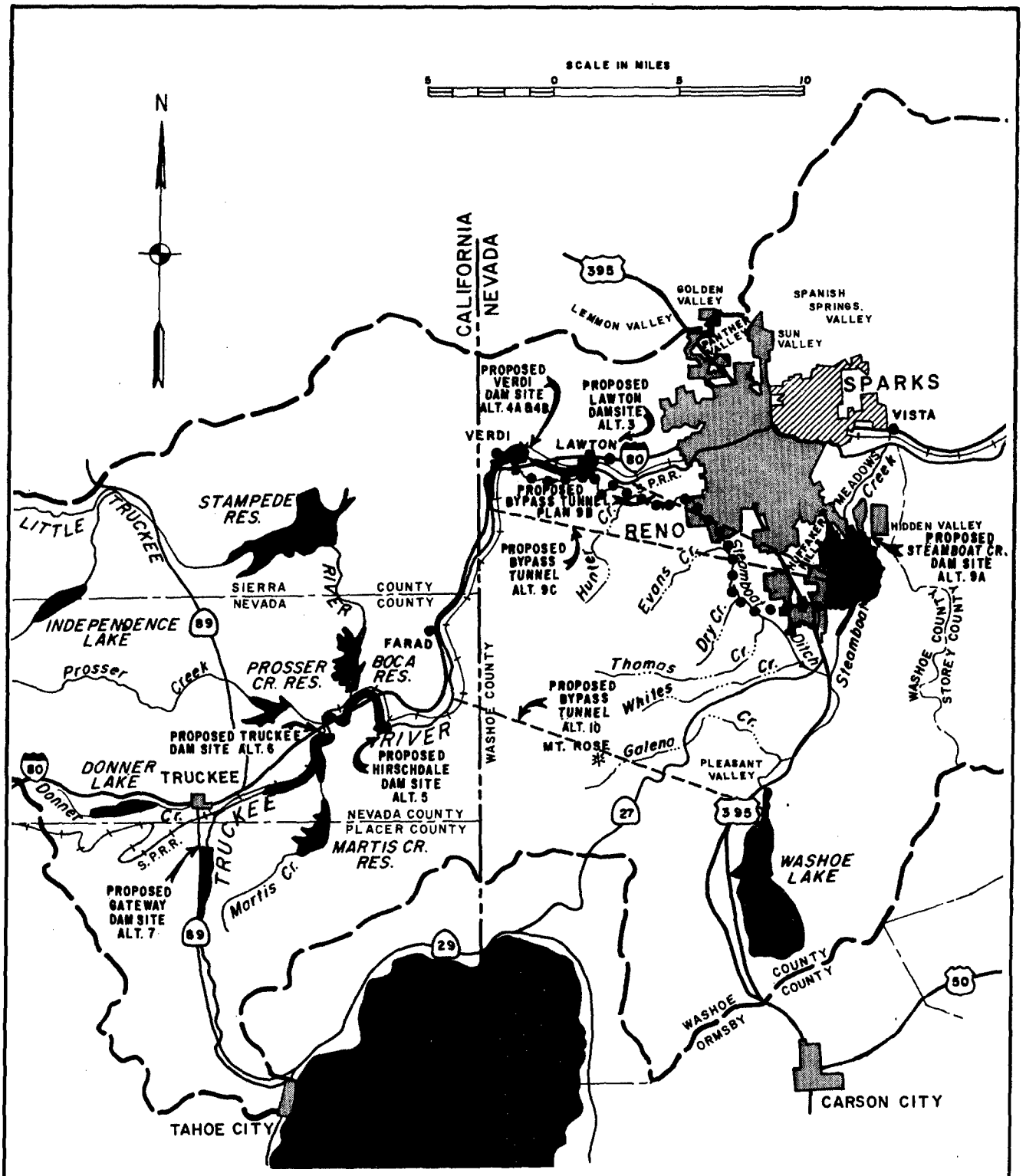
a. Reservoir Alternatives. - Reservoir alternatives are shown on Figure 10 and described below.

Alternative 3 - Lawton Dam and Reservoir. - The Lawton Dam and Reservoir would be located on the Truckee River about 3.5 miles upstream of Reno. The 35,000 acre-foot reservoir, with an earthfill dam 150 feet high, would have a drainage area in excess of 1,000 square miles and provide SPF protection. Construction would require the relocation of about 7 miles of Southern Pacific Railroad track, reconstruction of about 1 mile of Interstate Highway 80, and abandonment of the existing Washoe powerplant.

Alternative 4a - Verdi Dam and Reservoir (SPF). - The Verdi damsite is located on the Truckee River about 5 miles upstream of Reno; the dam would control about a 1,000-square-mile drainage area. The 35,000 acre-foot reservoir would have an earthfill dam 160 feet high with a crest length of 3,200 feet and would provide SPF protection. The dam would be located near the existing diversion dam for the Highlands Canal and Washoe Powerhouse. Construction of the dam and reservoir would require relocation of about 2 miles of Southern Pacific Railroad double track along the southerly perimeter of the reservoir; also, a new railroad bridge would be required across Truckee River downstream from the damsite. The Sierra Pacific Power Company's existing 3,350 KW capacity Verdi Powerhouse located within the proposed reservoir area would need to be abandoned. A Nevada State Fish Hatchery would have to be relocated and a new access road to Verdi provided. Significant social, economic, and environmental impacts would result from the extensive relocations required for construction of this dam and reservoir.

Alternative 4b - Verdi Dam and Reservoir (100-year). - The Verdi damsite could also be designed to provide up to 100-year flood protection. The 21,500 acre-foot reservoir would have an earthfill dam 90 feet high with a crest length of 2,800 feet. Necessary relocations would be similar to the SPF reservoir alternative. The outlet works for the 100-year dam would provide for a maximum release of 14,000 cfs.

Alternative 5 - Hirschdale Dam and Reservoir. - The 28,000 acre-foot dam and reservoir would be located on the Truckee River 1 mile downstream from Hirschdale. The dam would be a 160-foot-high earthfill structure with a crest length of 1,250 feet. Physical limitations of the



TRUCKEE MEADOWS INVESTIGATION
(RENO–SPARKS METROPOLITAN AREA)
NEVADA

LEGEND

●●●●●●● PROPOSED DIVERSION CHANNEL

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TRUCKEE RIVER AND STEAMBOAT CREEK RESERVOIR AND BYPASS ALTERNATIVES

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 10

site would prevent an increase beyond that capacity without encroachment on the existing Boca Dam. Construction of the dam would require relocation of about 5.5 miles of Southern Pacific Railroad double track downstream from the reservoir and along the northern perimeter. Reconstruction of about 1 mile of Interstate 80 would be required where the existing highway passes through the potential reservoir. Due to the uncontrolled inflow to the Truckee River downstream from the site and the limited capacity of the reservoir, this alternative would provide approximately 80-year flood protection to Reno and a minor increase in flood protection to the Truckee Meadows. The existing level of protection in Reno and Truckee Meadows is 60-year and 12-year, respectively.

Alternative 6 - Truckee Dam and Reservoir. - This 38,000 acre-foot reservoir and dam would be located on the Truckee River near the town of Truckee, California. The dam would be a 190-foot-high earthfill structure with a crest length of 2,140 feet located about one-half mile upstream from the mouth of Prosser Creek. Construction of the dam and reservoir would require the relocation of about 6 miles of Southern Pacific double track downstream from the reservoir and along the northern perimeter. Reconstruction of about 1 mile of Interstate 80 would be required to allow for grade separation between the highway and the relocated railroad.

The outlet works for the Truckee Dam would provide for a maximum release of about 12,000 cfs; however, when possible the reservoir would be operated to keep flows below 14,000 cfs in the Truckee River at Reno. Due to uncontrolled inflow to the Truckee River downstream from this site, this alternative would increase flood protection to Reno from 60- to 90-year and provide only a minor increase in flood protection to Truckee Meadows.

Alternative 7 - Gateway Dam and Reservoir. - This 20,000 acre-foot reservoir and dam would be constructed on the Truckee River near Gateway, about 1 mile upstream from the town of Truckee. The 145-foot-high earthfill dam would have a crest length of 1,080 feet. Construction of the dam and reservoir would require relocation of about 5.5 miles of State Highway 89 along the western perimeter of the reservoir. The outlet works for Gateway Dam would provide for a maximum release of about 5,000 cfs; however, reservoir releases would be restricted insofar as possible to flows which would not cause flows in Reno to exceed 14,000 cfs. However, due to uncontrolled inflow to Truckee River downstream from the site, this alternative increases flood protection to Reno from 60- to 70-year and provides only a minor increase in flood protection to Truckee Meadows.

Alternative 8 - Truckee River Tributary Reservoirs Above Reno. Storage on tributary streams, such as Dog Creek, Hunter Creek, Bronco Creek, Gray Creek, and other small tributaries which are upstream of Reno, would require as many as 10 reservoirs to provide control equal to storage on the main stem, since the drainage areas of these tributary streams are, individually, a small percentage of the total drainage basin. For example, a dam on Dog Creek would control about 16 square miles of drainage area, or about 6 percent of the drainage area contributing to floods in Reno (excluding areas controlled by existing reservoirs). Each of the small tributary reservoirs would cost $15 to $30 million, and the total cost to provide the same degree of flood control would be much more than the cost of a reservoir on the main stem of the Truckee River.

Alternative 9 - Steamboat Creek Reservoirs. - The Steamboat Creek reservoir alternative would include flow diversions from the Truckee River to a Huffaker Hills reservoir site by the use of bypass channel and/or tunnels. This dam and reservoir on Steamboat Creek would serve as a facility to regulate the flows, thereby providing flood protection to a portion of the Truckee Meadows.

Presently there are plans to develop the Huffaker Hills reservoir site for residential and commercial use, and it is expected that most of the reservoir area will be developed. Development in the potential reservoir area will preclude use of the Huffaker Hills site for flood control purposes. Extensive channel and levee work would also be necessary downstream on Steamboat Creek and along the Truckee River to provide a complete solution.

Alternative 9A - Steamboat Ditch Bypass Channel - This alternative consists of diverting floodflows from the Truckee River 13 miles southwest of Reno to the south along the existing Steamboat Ditch alignment and into the Huffaker Hills reservoir site on Steamboat Creek.

Manually operated gates would control the flows from the Truckee River to Steamboat Ditch during flooding. A fishery would be maintained by construction of a sluiceway through the diversion dam. To insure efficient operation of the channel during major floods, a debris collection basin would be constructed upstream of the diversion dam.

The diversion channel would extend for a distance of about 19 miles. Since Steamboat Ditch presently winds its way through recently constructed residential subdivisions, realignment of the diversion channel would be necessary. The channel would convey flows under US Highway 395 and finally empty into the Huffaker Hills reservoir site. Because of the high natural slope of the southern end of the channel, between 20 to 50 reinforced concrete drop structures would be necessary to dissipate the energy before the flows enter the reservoir. This reservoir would be designed to accommodate approximately 50,000 to 100,000 acre-feet of flood control storage, the estimated amount needed to temporarily store excessively high flows from the Truckee River. Steamboat Creek flows from the south through Huffaker Hills reservoir site, thus storage would be available for floodflows from this stream. The diversion channel would be designed to carry approximately 12,500 cfs.

Alternative 9B and 9C - Bypass Tunnels to Huffaker Hills Reservoir. - This plan would provide for a small dam to be constructed on the Truckee River to divert floodflows south of Reno, through a tunnel system, to Huffaker Hills reservoir on Steamboat Creek. Two potential tunnel alignments as shown on Figure 10 were considered.

9B - Truckee River near Hunter Creek to Huffaker Hills Reservoir.

9C - Truckee River near Fleish to Huffaker Hills Reservoir.

Alignment 9B showed relatively shallow cover, very little of which is founded in rock. If a tunnel along this alignment were restricted to areas of known rock, portal cuts would have to be on the order of 300 feet deep or

more. Because of the shallowness of the cover and unknown variables, such as weathering, fracturing, and other physical properties, the rock may not be capable of arching, and blasting could conceivably cause roof collapse, probably resulting in chimneying to the surface. Because this alignment passes through urban areas, such a failure could cause much damage and other complications. A tunnel constructed along this alignment would almost surely require 100 percent support for its entire length.

Alignment 9C appeared to be the most favorable of the alignments studied. Surface geology is mapped mainly as the Kate Peak Formation, but it is expected that the tunnel would also encounter abundant granitic rock types. Four faults are known to exist along the tunnel alignment, and two others are just east of the downstream portal.

The tunnel would require 4,000 feet minimum of 100 percent support. Again, it is important to note that the Kate Peak Volcanics are younger than the granitic rocks they overlie and mask other faults. Cover along this alignment is adequate and yet possibly shallow enough for ventilation shafts. Both horseshoe and circular designs can be considered.

Summary of Reservoir Alternatives. - Table 16 presents a summary of the various reservoir alternatives.

b. Alternative 10 - Bypass Tunnel from Truckee River near Iceland to Little Washoe Lake. - This alternative is similar to the previously mentioned bypass tunnels to Huffaker Hills reservoir on Steamboat Creek and is shown on Figure 10. A diversion dam would be located on the Truckee River near Iceland to divert floodflows into a tunnel extending about 13 miles underground through the Toiyabe National Forest to Little Washoe Lake. This alignment is the longest and deepest of the tunnel alignments studied.

Tunnel excavation would be mainly in Sierra Nevada granitic rock and the Kate Peak Formation. The tunnel would pass through eight known fault zones and would require a minimum of 6,000 feet of 100 percent support. Additional faults may be hidden beneath the younger volcanics. A major concern with this alignment is that it may result in large rock stresses and possible rock bursts. Maximum cover is more than 5,000 feet. Rock bursts cannot be predicted or prevented and represent a real danger. Shaft type ventilation systems would probably not be feasible in a tunnel with this amount of cover, and ground water would be more of a problem due to greater hydraulic head. If constructed, this tunnel would be of circular design only to minimize stress concentrations that may develop at corners of a horseshoe shaped tunnel.

c. Local Channel/Levee Plans. - Plans 11-13 provide three different levels of protection to the area through the use of levees and channel excavation below US 395 to the Vista reefs. In addition, Plans 12 and 13 include floodwalls and bridge replacement upstream of US 395.

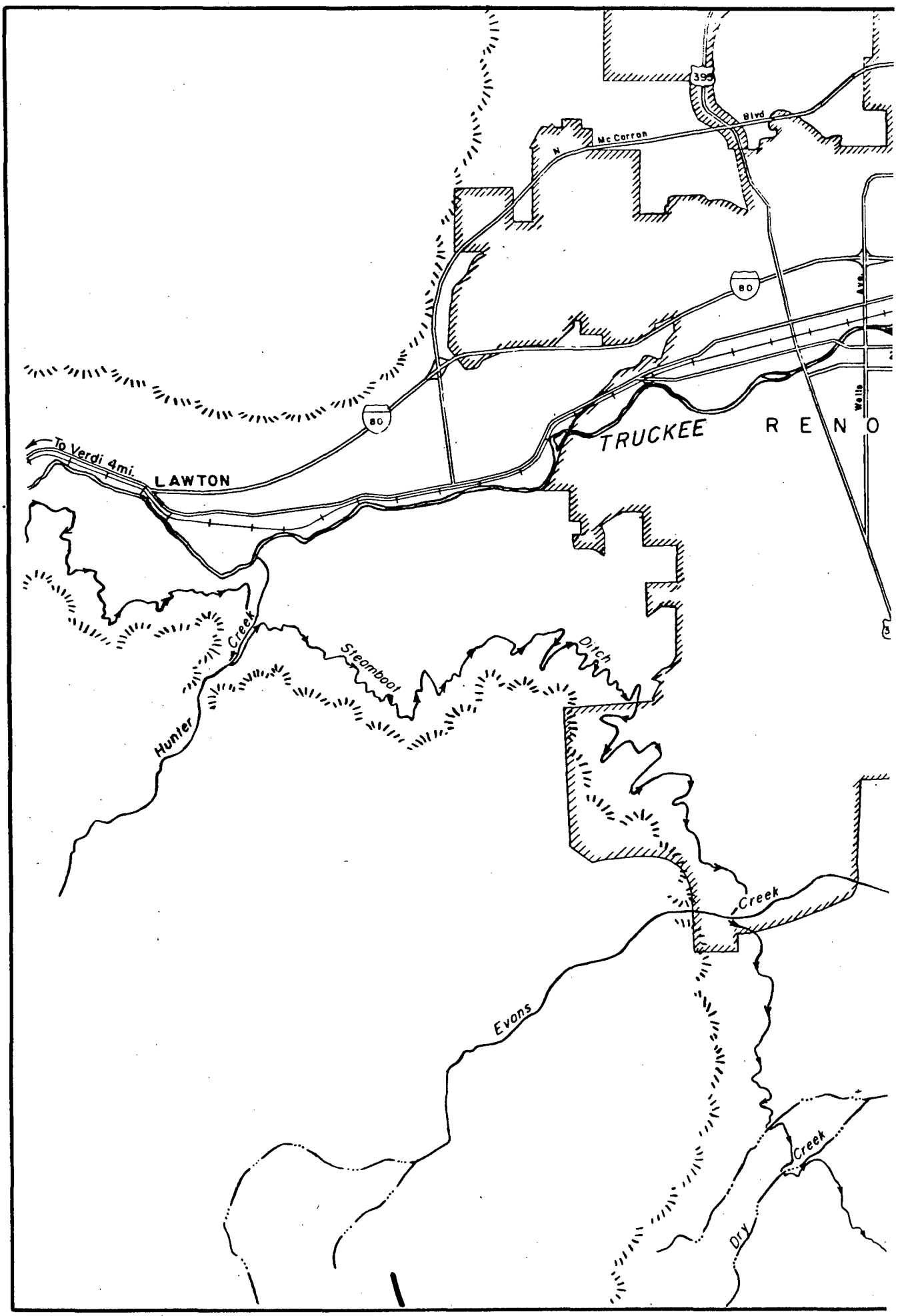
Alternative 11 - 60-year Channel/Levee Plan. - This plan, shown on Figure 11, consists of levee and channel excavation of the Truckee River from US 395 to Vista, a distance of about 6 miles. No supplemental flood protection would be given upstream of US 395 since it already has 60-year flood protection. The channel capacity below McCarran Boulevard would be

TABLE 16

SUMMARY OF RESERVOIR ALTERNATIVES

Alternative	Location	Capacity (Acre-Feet)	COMMENTS
3 - Lawton Dam and Reservoir	Truckee River 3.5 miles upstream of Reno	35,000	SPF Protection: Earthfill dam - 150' high Relocation: 7 miles SPRR track; 1 mile I-80 Abandonment: Washoe Power Plant
4A - Verdi Dam and Reservoir (SPF)	Truckee River 5 miles upstream of Reno	33,000	SPF Protection: Earthfill dam - 160' high, 3,200' long Relocation: 2 miles SPRR double track; Nevada State Fish Hatchery Construction: new RR bridge; new road to Verdi Abandonment: Sierra Pacific Power Co. 3,350 kW Verdi Powerhouse
4B - Verdi Dam and Reservoir (100-Year)	Truckee River 5 miles upstream of Reno	21,500	100-Year Protection: Earthfill dam - 90' high, 2,800' long Relocation: Similar to SPF
5 - Hirschdale Dam and Reservoir	Truckee River 1 mile downstream from Hirschdale	28,000	80-year protection to downtown Reno; minor increase in protection to Truckee Meadows Earthfill dam: 160' high, 1,250' long Relocation: 5.5 miles SPRR double track Reconstruction: 1 mile I-80
6 - Truckee Dam and Reservoir	Truckee River, Truckee CA, 1/2 mile upstream from mouth of Prosser Creek	38,000	90-year protection to downtown Reno; minor increase in protection to Truckee Meadows Earthfill dam: 190' high, 2,140' long Relocation: 6 miles SPRR double track Reconstruction: 1 mile I-80
7 - Gateway Dam and Reservoir	Truckee River 1 mile upstream of Truckee, CA, near Gateway	20,000	70-year protection to downtown Reno; minor increase in protection to Truckee Meadows Earthfill dam: 145' high, 1,080' long Relocation: 5.5 miles State Hwy. 89
8 - Reservoirs on Truckee River Tributaries above Reno	Varies	Varies	Up to 10 reservoirs required
9A - Steamboat Ditch Bypass Channel and Huffaker Hills	Steamboat Creek in Huffaker Hills	50,000-100,000	12,500 cfs diversion channel 13 miles long along existing Steamboat Ditch alignment
9B - Bypass Tunnel from Truckee River near Hunter Creek to Huffaker Hills Reservoir	Steamboat Creek in Huffaker Hills	50,000-100,000	Bypass tunnel from Truckee River near Hunter Creek to reservoir requiring 100% support
9C - Bypass Tunnel from Truckee River near Fleish to Huffaker Hills Reservoir	Steamboat Creek in Huffaker Hills	50,000-100,000	Bypass tunnel from Truckee River near Fleish to reservoir with 4,000 feet requiring 100% support

Views of the existing floodwalls through downtown Reno.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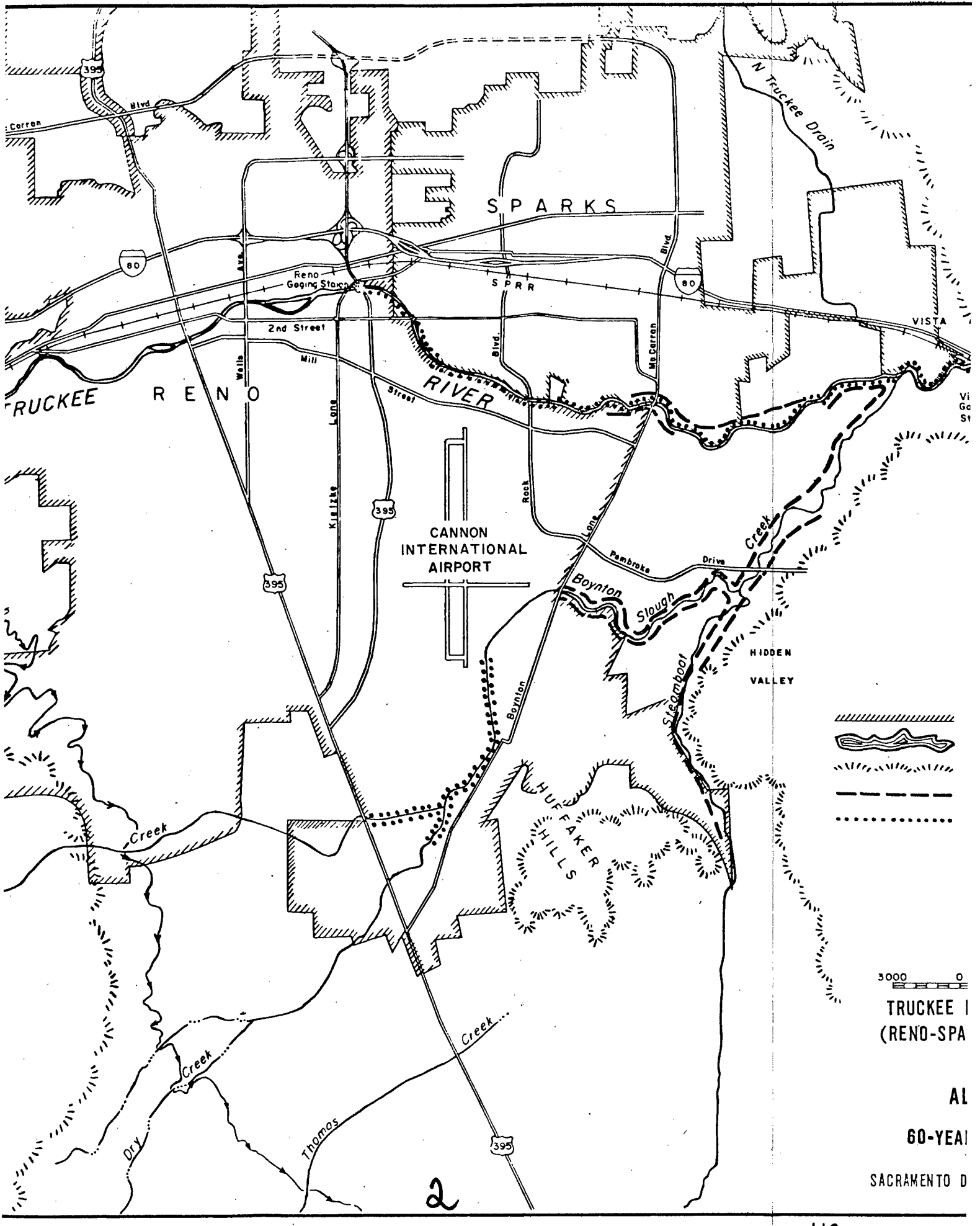
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Pembroke Drive
Lone Creek
Boynton Slough
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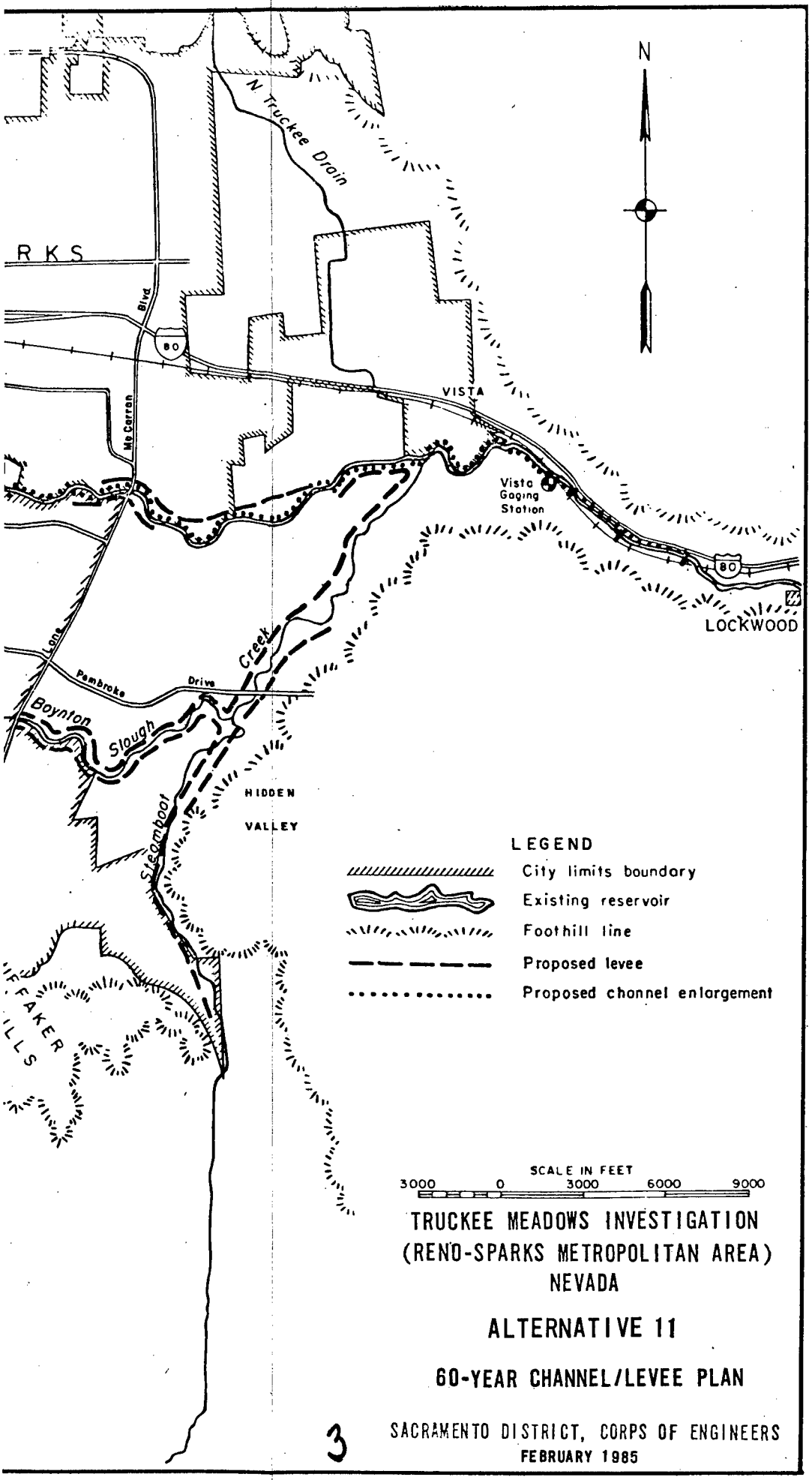
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Proposed levee
Proposed channel enlargement
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TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
ALTERNATIVE 11
60-YEAR CHANNEL/LEVEE PLAN
3
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 11

increased to 20,000 cfs. Channel and levee work along Steamboat Creek, Boynton Slough, Dry Creek, and Evans Creek would be designed to pass the 60-year flow.

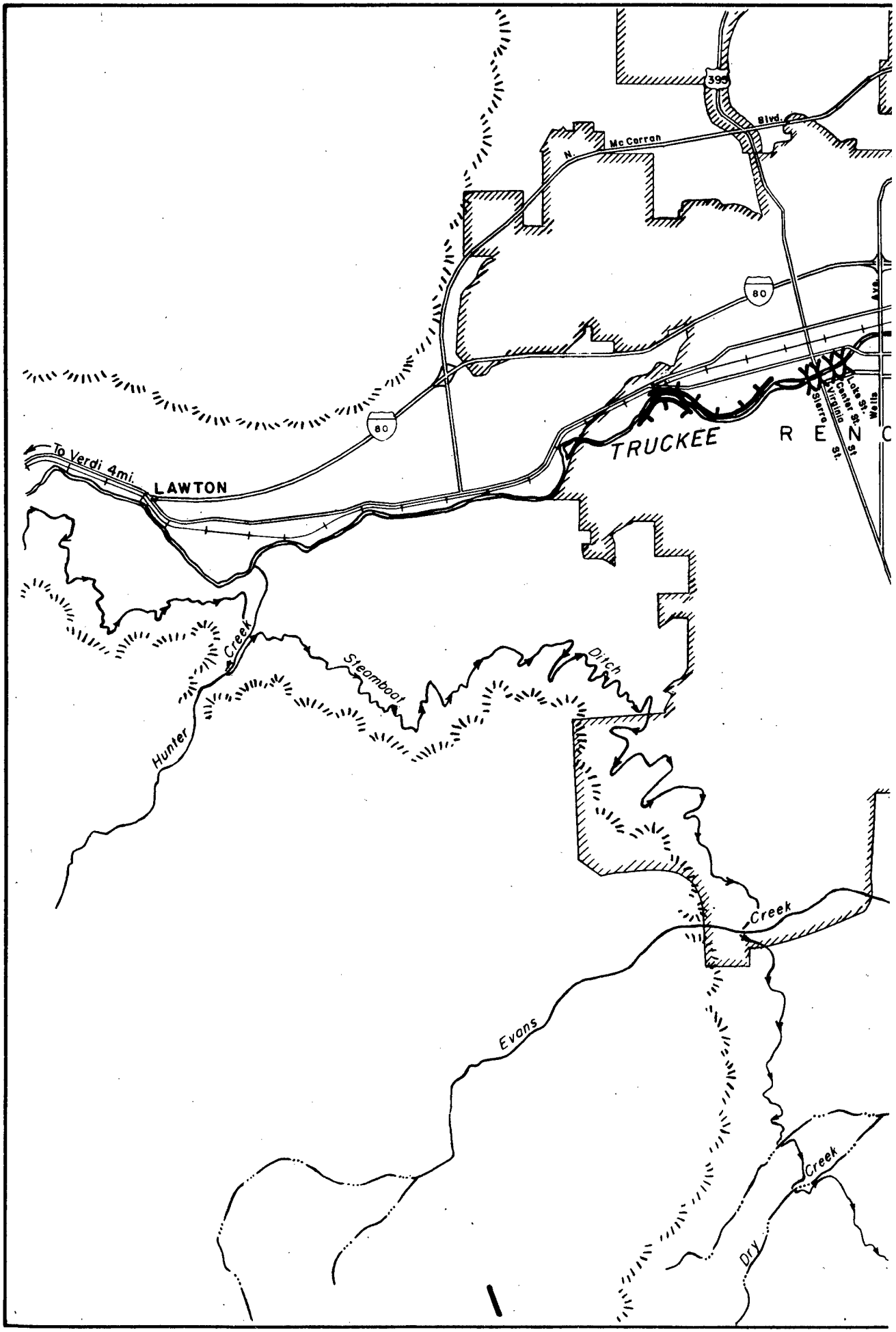
Alternative 12 - 100-year Channel/Levee Plan. - With this plan, the area along the Truckee River through downtown Reno (from above Reno to US Highway 395) would realize increased flood protection by the construction of floodwalls and removal and replacement of four bridges (Lake, Center, Virginia, and Sierra Streets). The channel capacity would be increased from the existing 14,000 cfs to the 100-year peak flow of 18,500 cfs. Below U.S. Highway 395 to McCarran Boulevard, additional channel excavation would increase channel capacity to 18,500 cfs. Some levee work would be needed immediately upstream of McCarran Boulevard. Continuous levees would be placed on both banks of the river between McCarran Boulevard and Vista to augment protection provided by channel excavation through this reach. The channel capacity below McCarran Boulevard would be 27,000 cfs to accommodate the effects of Steamboat Creek. Channel and levee work along Steamboat Creek, Boynton Slough, Dry Creek, and Evans Creek would be designed to pass the 100-year flow. Alternative 12 is displayed in Figure 12.

Alternative 13 - Standard Project Flood Channel/Levee Plan. - Protection against the Standard Project Flood could be achieved in a manner similar to that of Alternative 12 with the addition of a bypass tunnel in downtown Reno in lieu of bridge replacement. Also, more extensive levees and channels downstream of U.S. 395 would be required. Alternative 13 is displayed in Figure 13.

The alternative would consist of a bypass channel which would divert flows exceeding 14,000 cfs away from the river in the downtown reach. The Standard Project Flood would produce a peak flow of 39,800 cfs in this reach. Two alignments were considered for the bypass channel: an underground conduit constructed beneath Second Street and a diversion channel along the Southern Pacific Railroad (SPRR). Either channel would be designed to flow back into the Truckee River in the vicinity of the Wells Avenue Bridge. Because of the high cost of construction and relocations expected with the Second Street alignment, only the alignment adjacent to the SPRR was considered further.

Intermittent levees would be required for the reach between U.S. 395 and Rock Boulevard. Channelization would also be required to carry SPF flows. In order to maintain the natural characteristics of the channel, excavation would begin at least 3 feet above the existing channel invert. Riprap would be placed on the excavated side slopes to prevent bank erosion.

Continuous levees and channel work are required between Rock Boulevard and Vista. Because of the contributing influence of the tributary flows to the Truckee River and the loss of natural storage in the Meadows, the levees and channels would be designed to carry 53,000 cfs between McCarran Boulevard and Vista. Except for the increased design requirements on the tributaries, backwater levees and channel excavation for Steamboat Creek, Boynton Slough, Evans Creek, and Dry Creek would be similar to Alternative 12. The only structural improvement needed for North Truckee Drain is a gated structure to be placed at the confluence of the drain with the Truckee River.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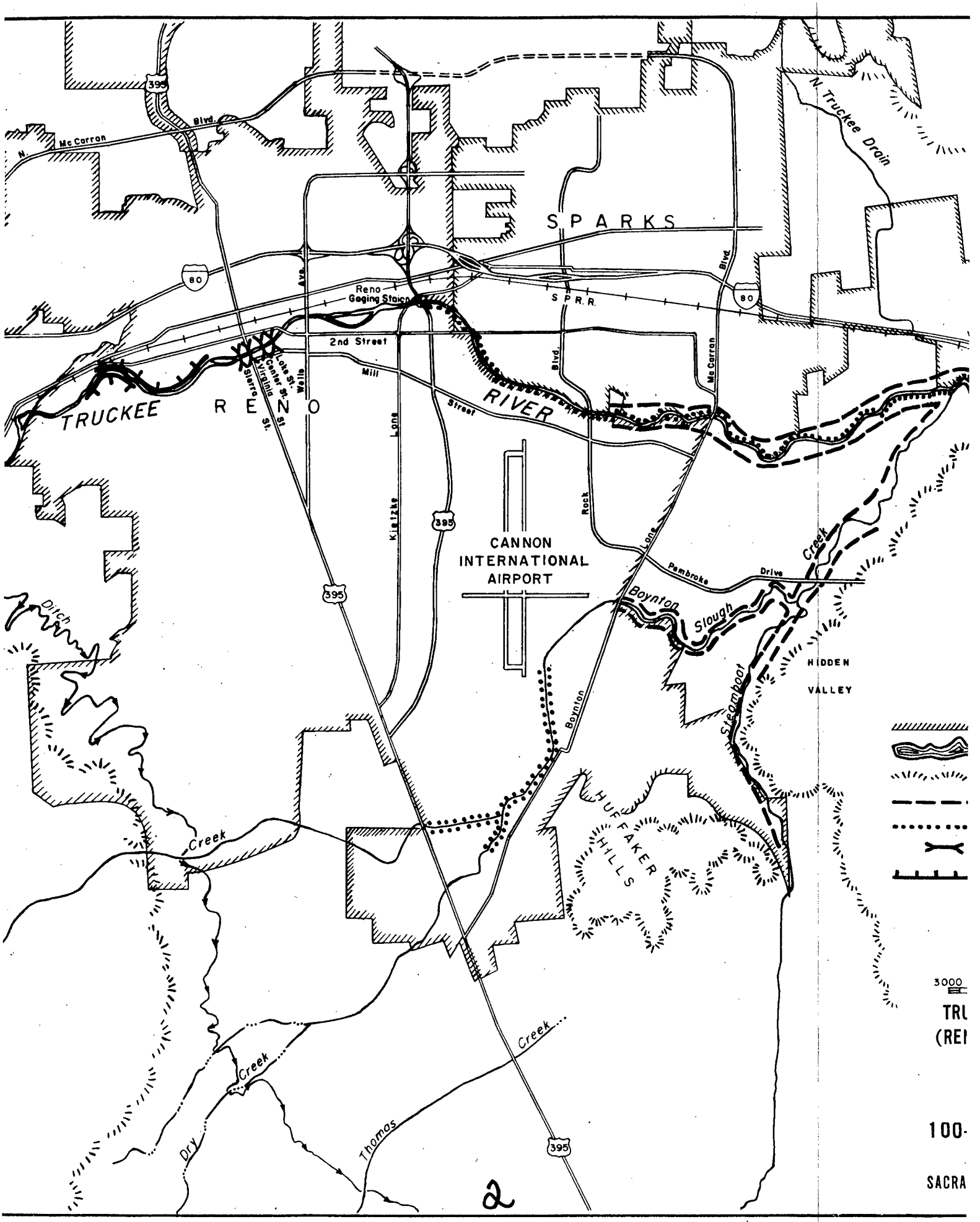
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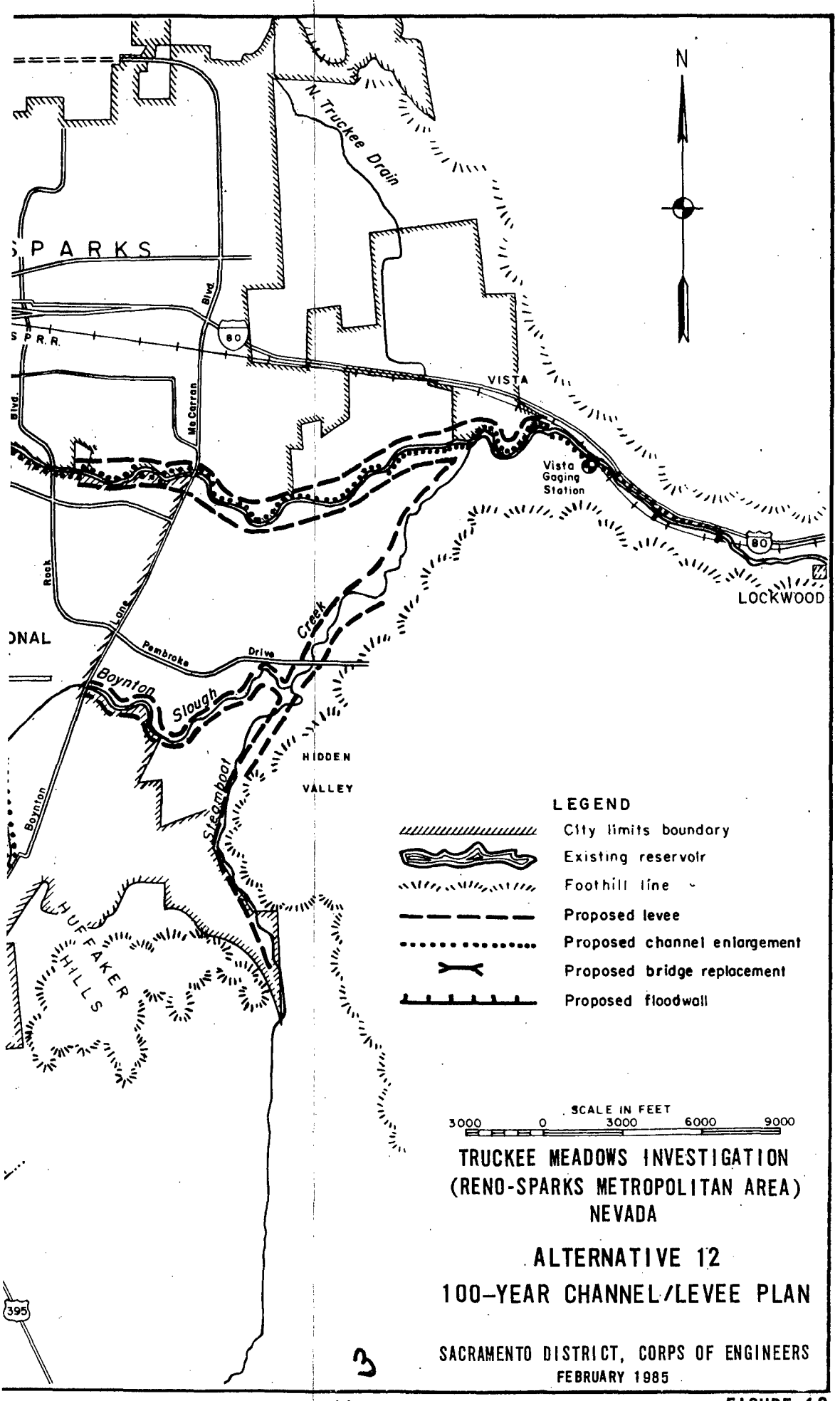
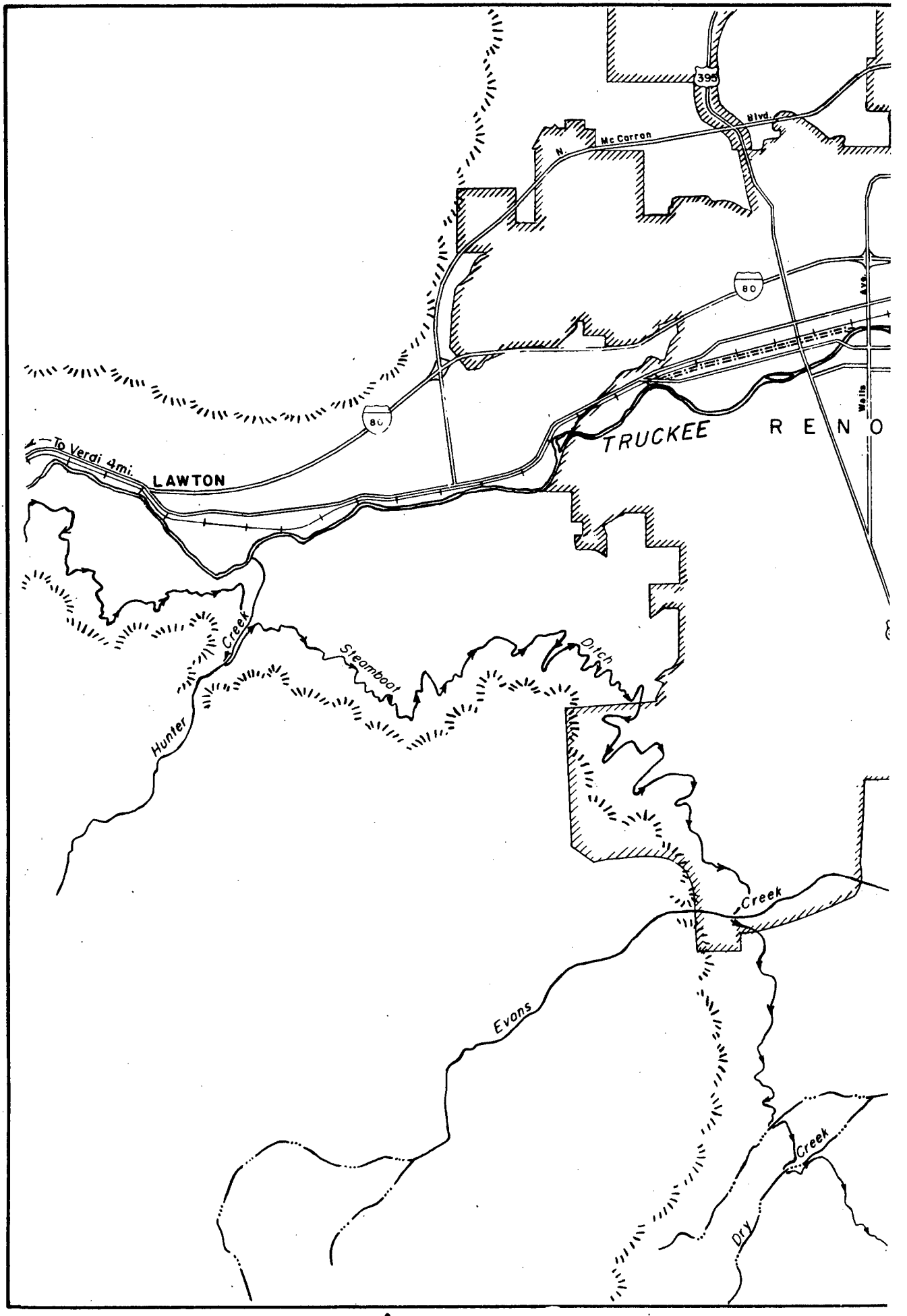


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

ALTERNATIVE 12
100-YEAR CHANNEL/LEVEE PLAN

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 12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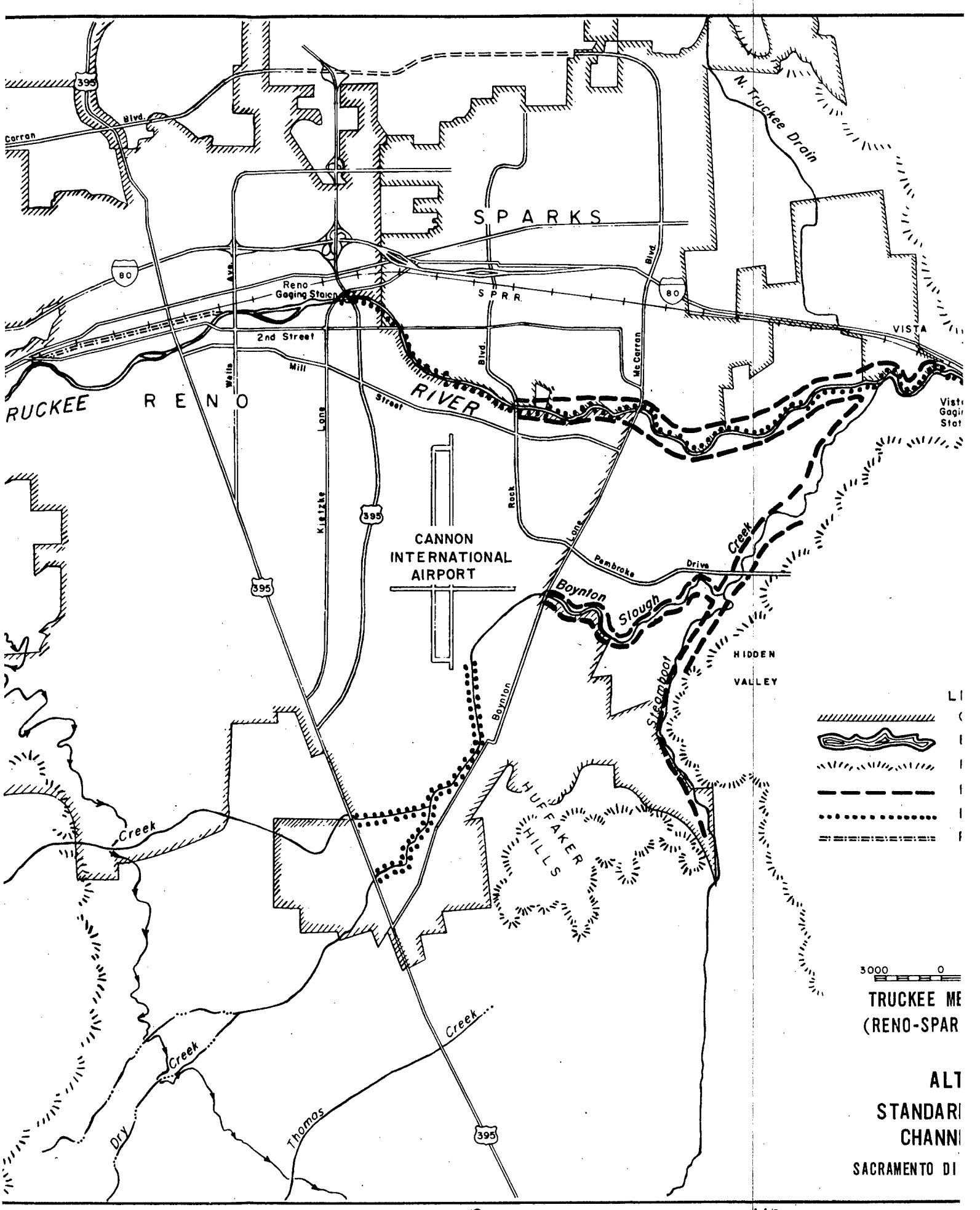
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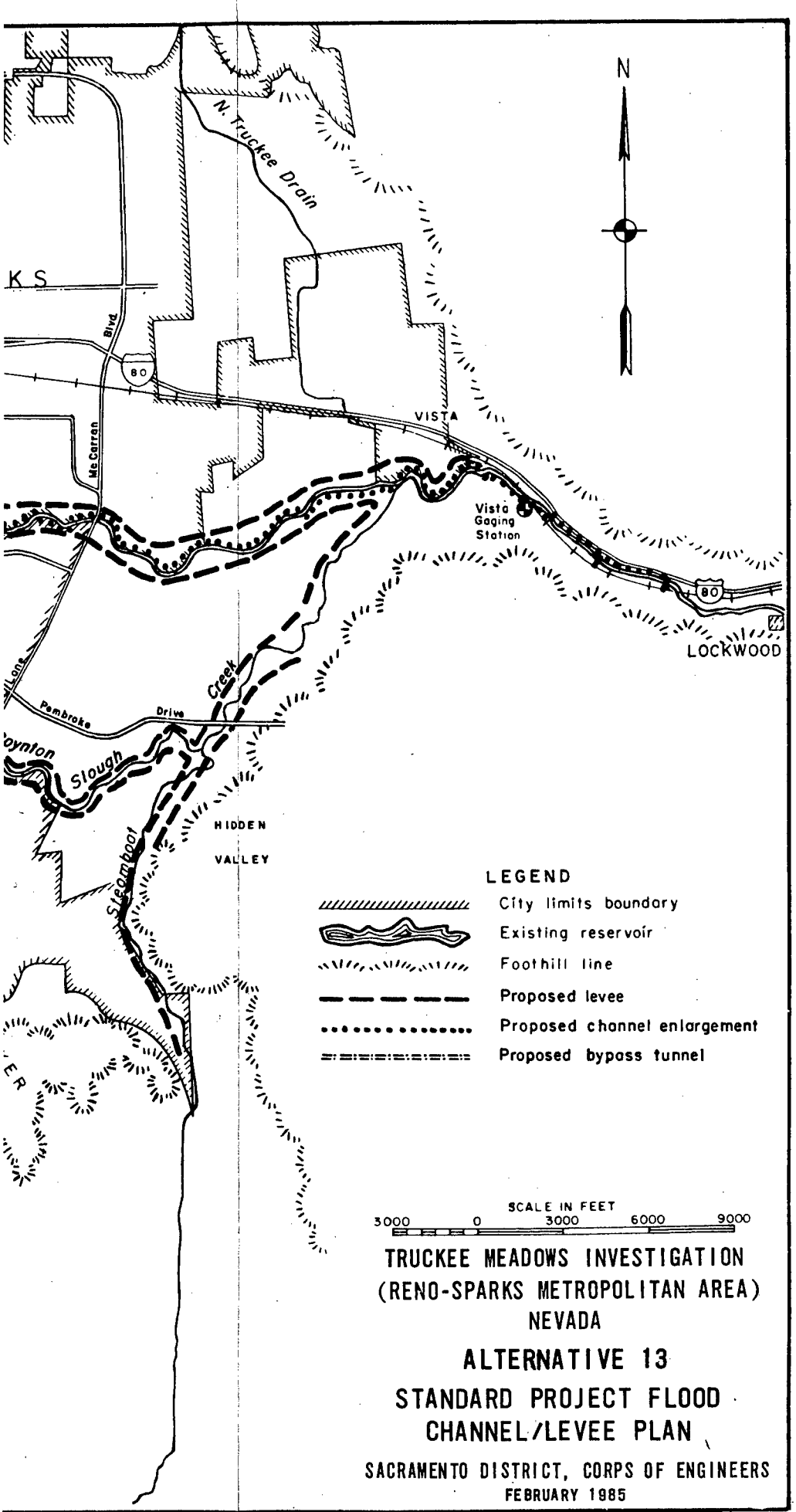


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

ALTERNATIVE 13

STANDARD PROJECT FLOOD
CHANNEL/LEVEE PLAN

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

3

FIGURE 13

d. National Economic Development (NED) Plan. -

The plan that results in a maximum net economic return determines the NED plan. Net economic benefits are maximized when the plan scale is optimized and the plan is efficient. The scale is optimized when the benefits of the last increment of output for each measure in the plan equals the cost of that increment. The plan is efficient when the outputs of the plan are achieved in a least-cost manner. The 100-year channel/levee alternative (12) is designated the NED Plan.

F. COMPARISON OF ALTERNATIVES

The alternative plans were formulated in such a way that they exhibit the potential for becoming plans that are (1) complete (contain the necessary ingredients to realize desired benefits), (2) effective (alleviate the problems and realize the opportunities), (3) efficient (the most cost effective), and (4) acceptable (feasible from an economic, social, environmental, legal, political, and financial standpoint). This provided an effective way to identify plans that were to be considered further.

Alternative 1 - No Action. - This plan was considered further.

Alternative 2 - Nonstructural Plan. - This alternative included flood plain zoning, flood warning/fighting programs, and flood proofing. Flood plain zoning regulations are currently being instituted by Reno, Sparks, and Washoe County by participation in the National Flood Insurance Program. Flood warning/fighting programs have been developed and are believed adequate. Flood proofing measures were found to be economically infeasible. Furthermore, nonstructural measures would not reduce flood damages that would continue to roads and railways, improvements around buildings, and certain utilities. Business activities would be interrupted, and deposition of debris in the Meadows would continue. Therefore, this alternative was not considered further.

Alternative 3 - Lawton Dam and Reservoir. - The high cost for this project would make this alternative infeasible; furthermore, channel work, which would add to the cost, would be necessary downstream to adequately address the flood problem. Therefore, this alternative was not considered further.

Alternatives 4A&B - Verdi Dam and Reservoir (SPF) (100-year). - Because of the high cost of these reservoirs, these alternatives would not be economically feasible and were not considered further.

Alternative 5 - Hirschdale Dam and Reservoir. - This reservoir is limited in size; because of its small size and inflow to Truckee River downstream from the site, floods in Reno and Truckee Meadows exceeding channel capacities would still be frequent, and additional downstream channel modifications would be necessary. High construction costs make this project economically infeasible; therefore, the alternative was not considered further.

Alternative 6 - Truckee Dam and Reservoir. - Due to uncontrolled inflow to Truckee River downstream from this site, flooding in Reno and Truckee Meadows would only be reduced by a small amount. In addition, this plan was found to be economically infeasible and was not considered further.

Alternative 7 - Gateway Dam and Reservoir. - Due to uncontrolled inflow to Truckee River downstream from the site, flooding in Reno and Truckee Meadows would only be reduced by a small amount. In addition, this plan was found to be economically infeasible and was not considered further.

Alternative 8 - Truckee River Tributary Reservoirs above Reno. - The cost to provide flood protection by constructing a number of small reservoirs that would be necessary makes this project economically infeasible, and it was not considered further.

Alternative 9A - Steamboat Ditch Bypass Channel. - Diverting floodflows from Truckee River along Steamboat Ditch and into the reservoir on Steamboat Creek is not economically feasible and was not considered further.

Alternative 9B - Bypass Tunnel from Truckee River near Hunter Creek to Huffaker Hills Reservoir. - Geologic field investigations indicated the tunnel would require 100 percent support for its entire length; consequently, the plan was economically infeasible, and the alternative was eliminated from further study.

Alternative 9C - Bypass Tunnel from Truckee River near Fleish to Huffaker Hills Reservoir. - Because of high expected costs of the tunnel, the economic infeasibility, and the geologic uncertainty, this alternative was not considered further.

Alternative 10 - Bypass Tunnel from Truckee River near Iceland to Little Washoe Lake. - Because of high expected costs of the tunnel, the economic infeasibility, and the geologic uncertainty, this alternative was not considered further.

Alternative 11 - 60-year Channel/Levee Plan. - Because local interests desire to increase the 60-year flood protection already existing in the downtown Reno area and also because the 100-year plan is more cost effective and provides greater net benefits (as shown in Table 17 and Figure 14), this alternative was not considered further.

Alternative 12 - 100-year Channel/Levee Plan. - This plan was considered further.

Alternative 13 - Standard Project Flood Channel/Levee Plan. - Because local interests oppose this plan and also because the 100-year plan is more cost effective and provides greater net benefits (as shown on Table 17 and Figure 14), this alternative was not considered further.

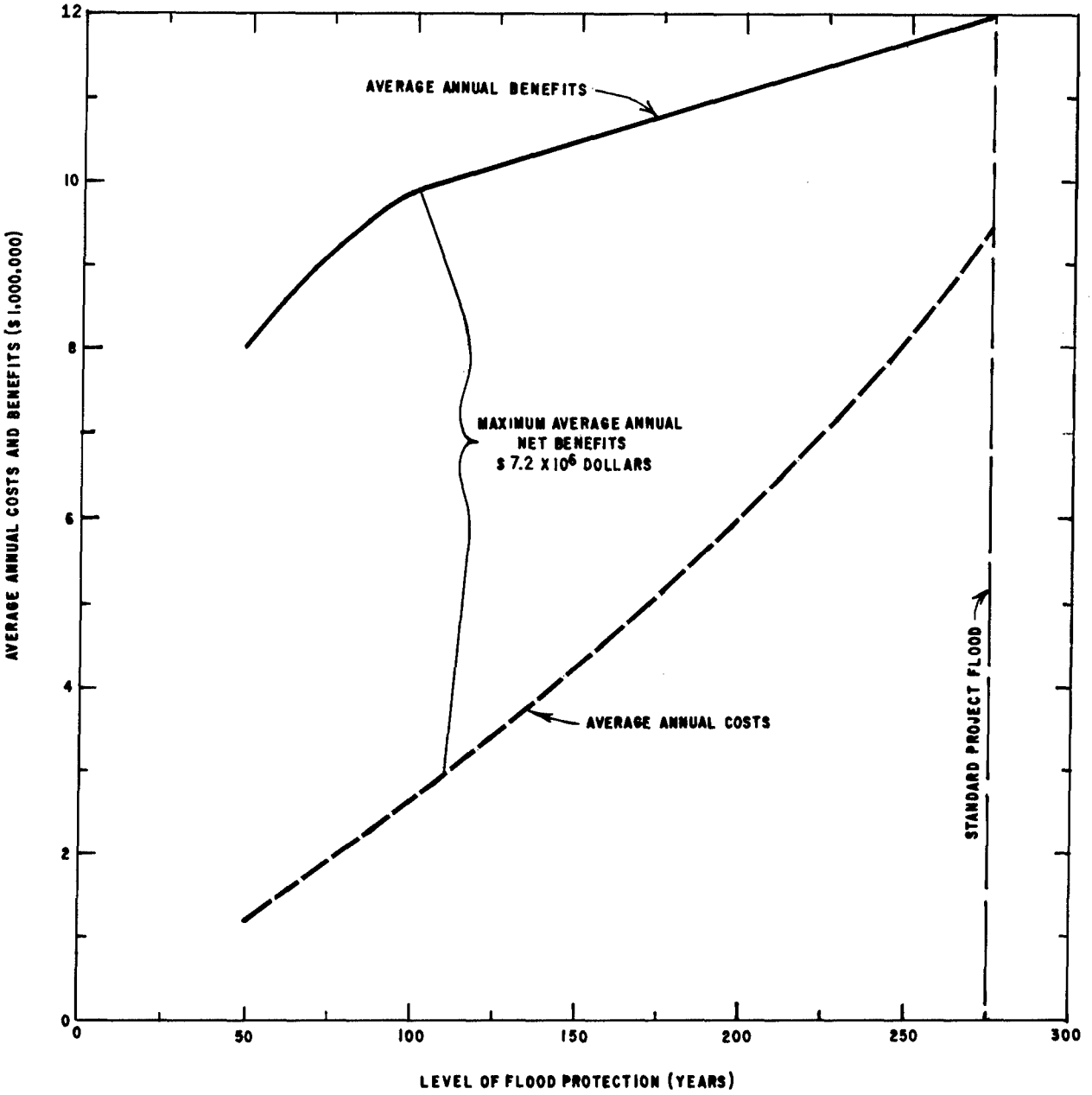
The comparison of alternatives is summarized in Table 18.

Table 17

ECONOMIC COMPARISON OF CHANNEL/LEVEE PLAN
FOR VARIOUS LEVELS OF PROTECTION*
($1,000)
(8-3/8% Interest Rate; October 1984 Prices)

	Annual Flood Control		
Plan	Costs	Benefits	Net Benefits
60-Year Channel-Levee	1,450	8,520	7,070
100-Year Channel-Levee	2,630	9,860	7,230
SPF Channel-Levee	9,430	12,090	2,660

*Based on analysis conducted in 1979.



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

DETERMINATION OF MAXIMUM
NET BENEFITS FOR
CHANNEL/LEVEE PLAN

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 14

TABLE 18
COMPARISON OF STRUCTURAL ALTERNATIVES

ALTERNATIVE	B/C RATIO	COMPLETENESS	EFFECTIVENESS	EFFICIENCY	ACCEPTABILITY	RESULT
Reservoirs	<1:1	Complete - Lawton and Verdi Reservoirs would provide a high degree of protection. Truckee, Gateway, & Hirschdale Reservoirs provide a small increase in protection over existing conditions, which could be increased with channel and levee work in Reno and Sparks.	Effective - Assuming certain features of the Channel/Levee Plan would be required in Sparks (Lawton, Gateway). Truckee, Gateway, & Hirschdale are only partially effective and would require significant channel/levee work to be effective.	Inefficient - Channel/ Levee Plan is more cost effective.	Unacceptable - Locals have indicated their opposition to additional upstream storage primarily due to lands/relocations required. Compatible with plans of others.	Deleted
Bypass/ Reservoir Systems	<1:1	Complete - Provides same degree of protection as Channel/Levee Plan.	Effective - Hunter, Fleish, & Iceland have geologic problems which could reduce their effectiveness.	Inefficient -Channel/ Levee Plan is more cost effective.	Unacceptable - Land use projections from Washoe County preclude development of the Huffaker Hills site as a reservoir (Steamboat Ditch, Hunter, Fleisch). Because the Iceland Bypass was not economically justified, its acceptability was not evaluated. Compatible with plans of others.	Deleted
Channel/ Levee Plan			Effective.		Downstream interests have concerns about the potential adverse impacts from higher downstream flows. Compatable with plans of others. Coordination of final plan is necessary to maintain compatibility.	Retained for future study
60-Year	>1:1	Complete - Provides 60-year protection.		Inefficient - 100-year plan provides greater net NED benefits.	Unacceptable to the City of Reno - provides no additional protection to downtown area.	Deleted
100-Year	>1:1	Complete - Provides 100-year protection.		Efficient - Maximizes NED benefits.	Acceptable to local interests in Reno/Sparks area.	Retained for future study
SPF	>1:1	Complete - Provides SPF protection.		Inefficient - 100-year plan provides greater net NED benefits.	Unacceptable - Local opposition to extensive channel/levee work and tunnel bypass.	Deleted

G. CHANNEL/LEVEE PLAN FURTHER CONSIDERED

The channel/levee plan for 100-year protection shown on Figure 15, is a combination of bridge replacement, channel modification, floodwalls, and levees. Four bridges in the downtown area of Reno would be replaced and some floodwalls would be added to increase channel capacity. Existing floodwalls would be reconstructed to a higher elevation. The four bridges are located at Lake Street, Center Street, Virginia Street, and Sierra Street.

Between U.S. 395 and McCarran Boulevard, channel enlargement of the Truckee River will be required. The average channel bottom width would range between 200 to 250 feet, with 24-inch riprap placed where excavation occurs. Some modest levee work would be necessary immediately upstream of McCarran Boulevard. No levees would be necessary upstream of Rock Boulevard.

Continuous levees would be placed on both banks of the river between McCarran Boulevard and Vista to augment the protection provided by channel excavation in this reach. The excavated channel bottom width would be 200 to 260 feet. Channel excavation would also be necessary between Vista and Southern Pacific Railroad, 6,000 feet downstream of Vista. The channel will have a bottom width of 200-260 feet.

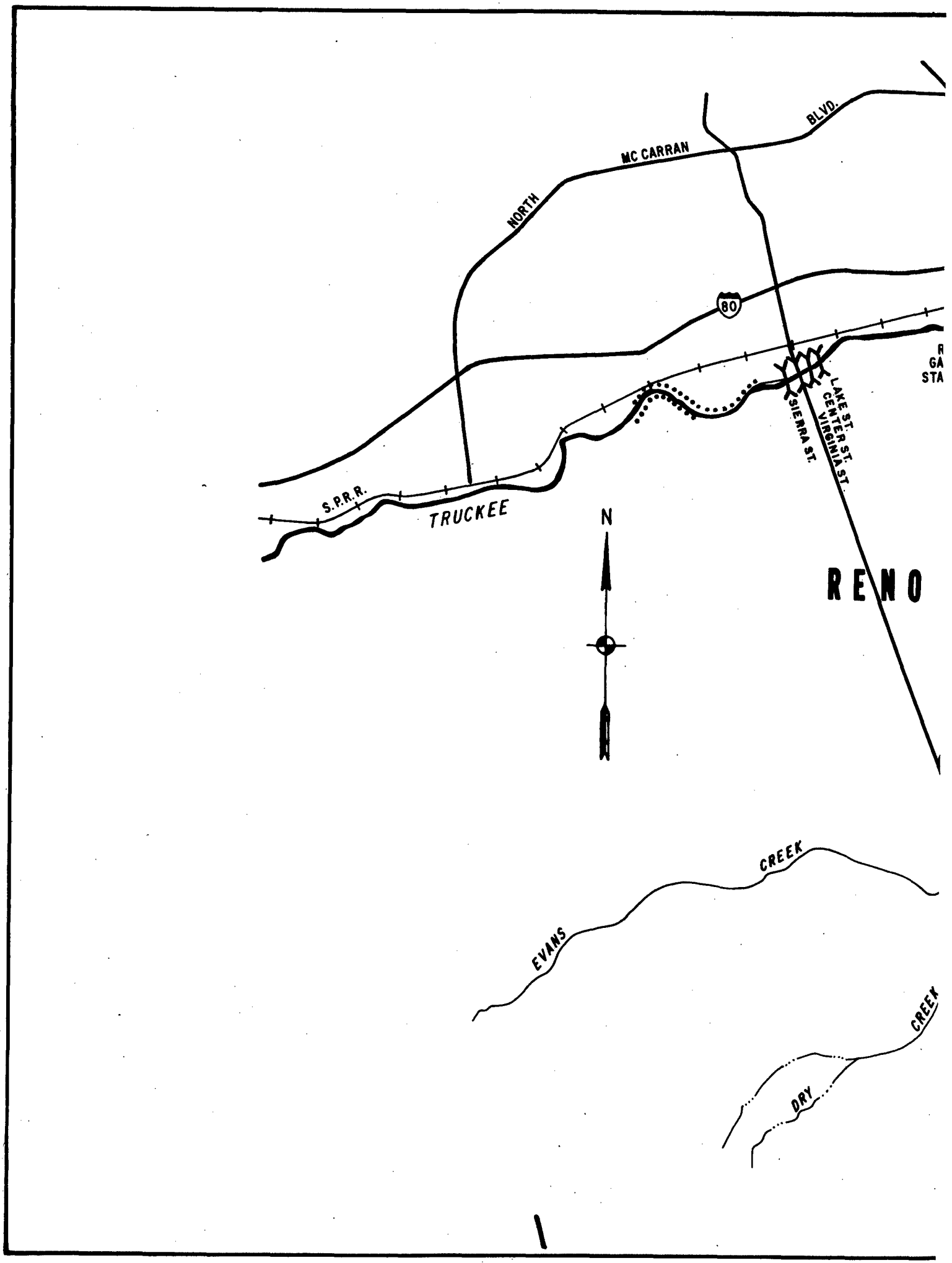
Levees would be provided along Steamboat Creek and Boynton Slough to prevent overflow from these tributary streams during the high stages of the Truckee River. A gated structure placed at the mouth of North Truckee Drain would allow flows from that stream to enter the Truckee River and would also prevent backwater effects from the Truckee River.

The channel and levee work on Steamboat Creek would extend from the confluence with the Truckee River 5 miles upstream to Short Lane near Huffaker Hills. Riprap will be needed to protect the right channel bank of Steamboat Creek because of high velocities. Levees would be intermittent on the right bank of Steamboat Creek, as the stream borders the side of adjacent foothills. Pembroke Drive and Kimlick Lane bridges would be reconstructed to accommodate design flows.

Boynton Slough, an interior drainage facility about 2.8 miles long, presently flows into Steamboat Creek. Under project conditions, this facility would be enlarged to accommodate the design flow and Truckee River backwater flows. Boynton Slough conveys flows from Dry and Evans Creeks, and some interior drainage. Under project conditions, enlargement would consist only of that necessary to provide protection from the Truckee River backwater. Bridges at Boynton Lane and Peckham Lane and two small farm bridges would require some modifications.

A 4,000-foot channel bypass would be constructed to divert floodflows from Dry Creek, below U.S. 395 south of Reno, into Boynton Slough. Riprap will be needed for the bypass channel and for the excavated side slopes upstream of the bypass channel. A drainage structure, at the mouth of Dry Creek, would allow local drainage water accumulated between Peckham Lane and its mouth to enter Boynton Slough.

Evans Creek would require channel improvement from its confluence with Dry Creek to U.S. 395, a distance of over 3,000 feet. Because of high velocities, riprap would be placed on the creek sides for erosion control.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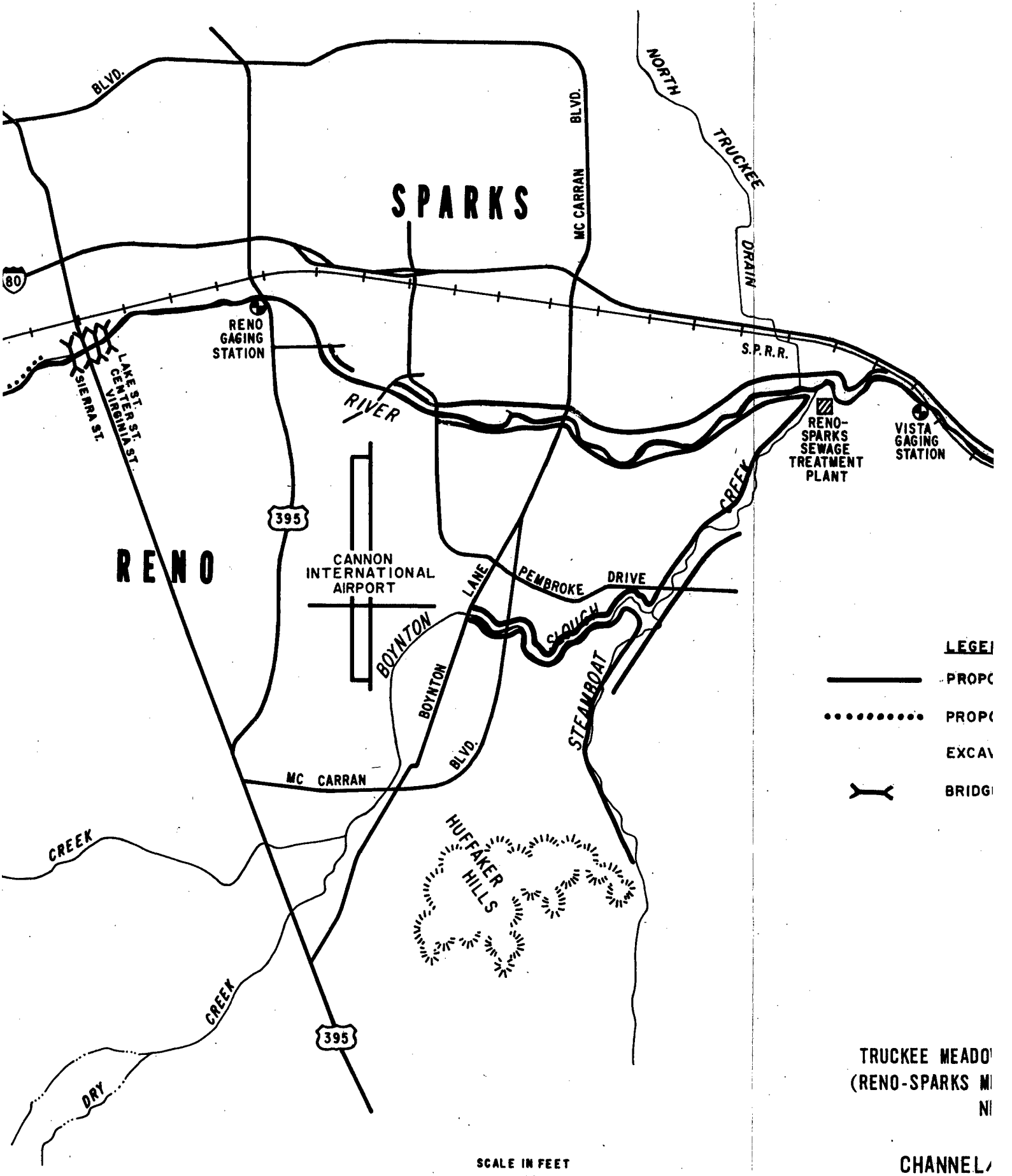

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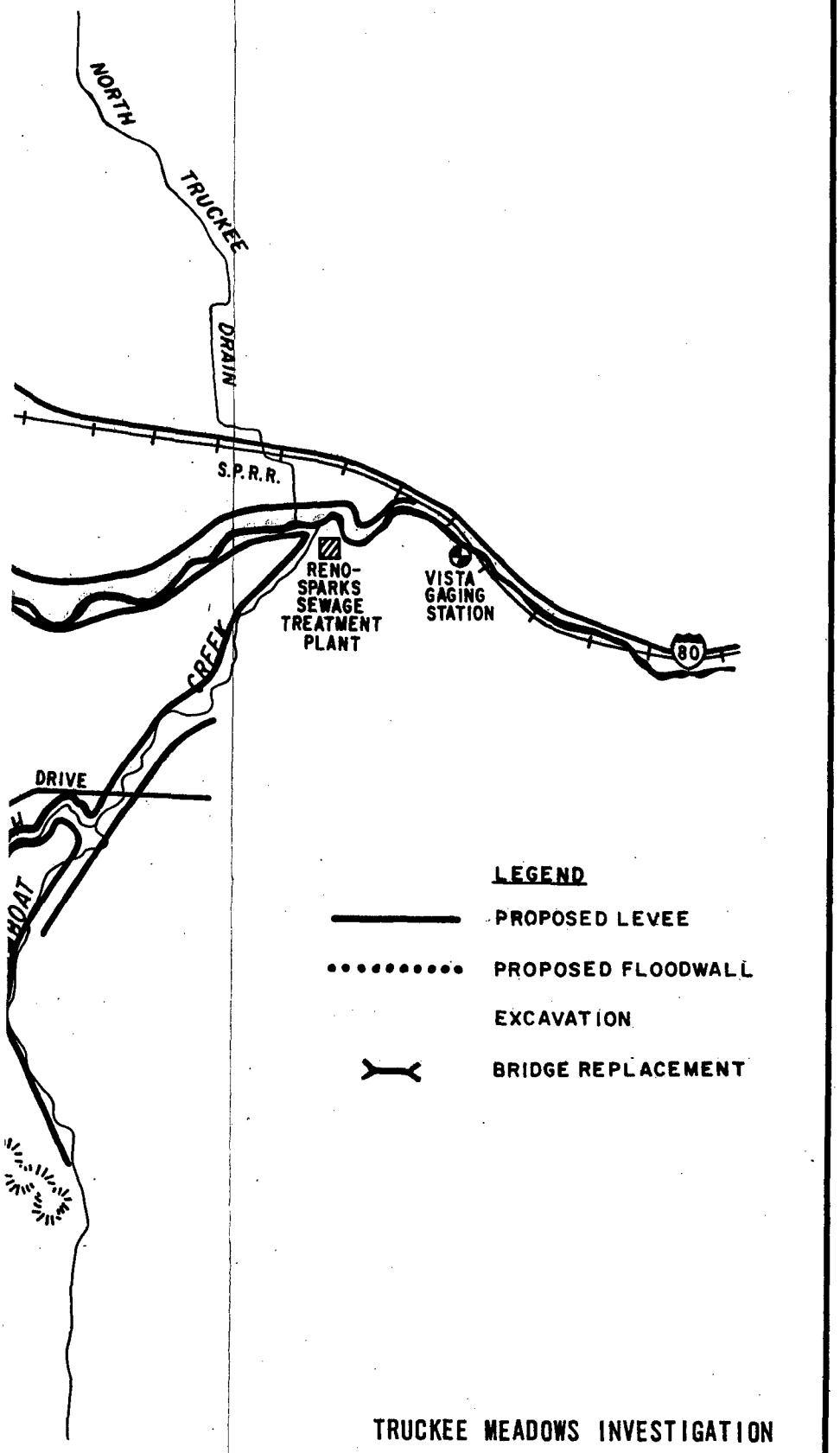


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

CHANNEL/LEVEE PLAN

3 SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 15

H. DEVELOPMENT OF SELECTED FLOOD CONTROL PLAN

Further refinements were necessary to address several areas of concern. Analysis of downstream impacts was necessary to determine their extent and the necessary mitigation measures. A review of the tributary components of the plan was necessary to determine the extent of project improvements. The impacts of the plan on existing interior drainage as well as the necessity of incorporating interior flood control facilities into the plan needed to be evaluated. The impacts of floodflows exceeding design (100-year) flows also needed to be reviewed and any needed modifications made. This further detailed analysis of the channel/levee plan has resulted in various modifications to the basic plan, as described below.

1. Downstream Impacts. - The channel/levee plan (NED) will confine floodflows to the channel through the project area and will lower the Vista reefs, resulting in increased flows below Vista during flood stage. With the channel/levee system, the 100-year peak flow at Vista is 23,500 cfs, while the preproject peak flow is 19,900 cfs. This increase in flow will result in additional damages to downstream areas.

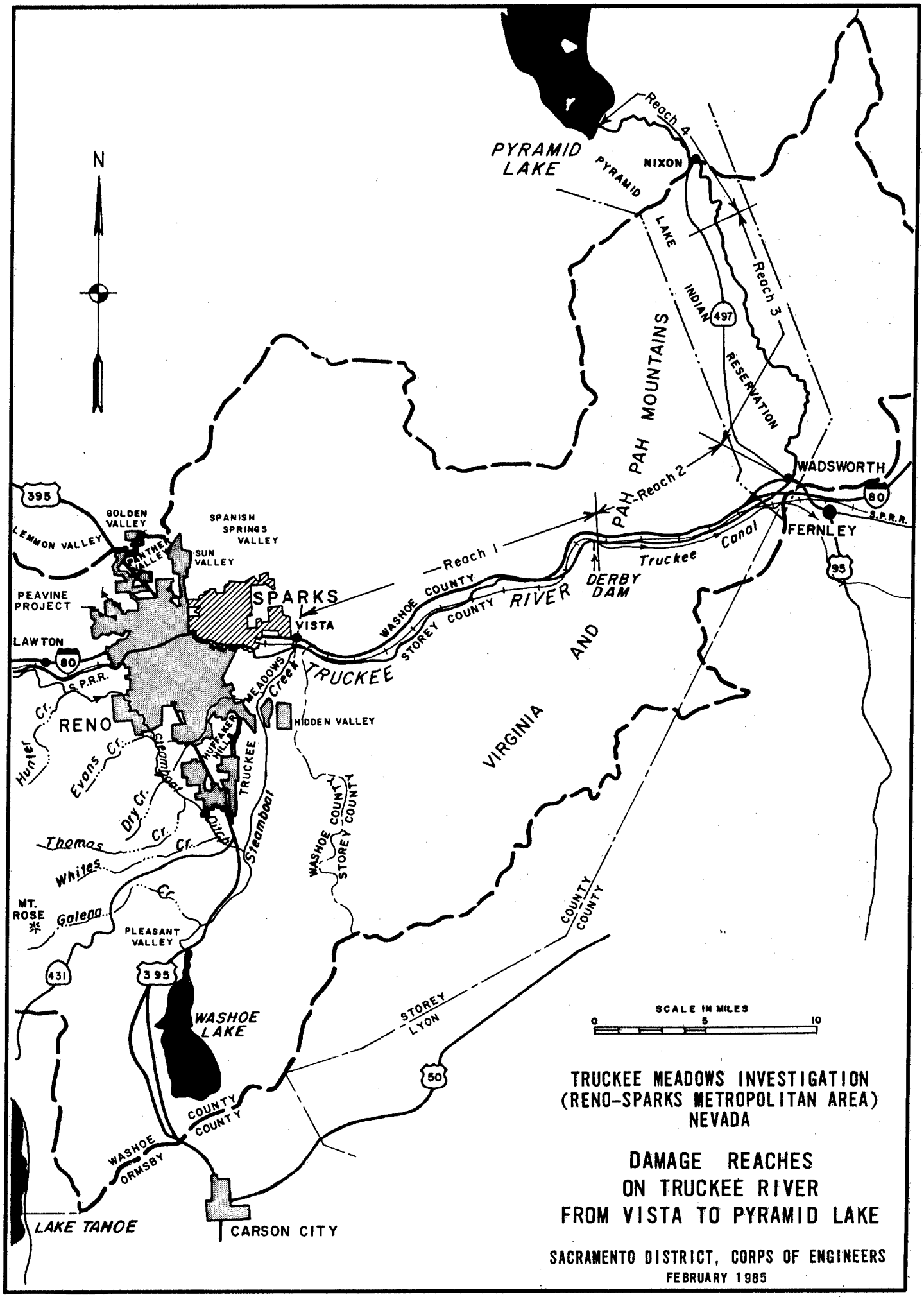
Figure 16 displays the Truckee River downstream from the project area from Vista to Pyramid Lake. For analysis, the river was divided into four reaches.

Reach Number	Reach Description
1	Vista to Derby Dam
2	Derby Dam to Wadsworth
3	Wadsworth to Nixon
4	Nixon to Pyramid Lake

Impacts of the channel/levee plan relative to floodflows, water depths, and flood plain areas were evaluated. Table 19 presents impacts of the 100-year channel/levee plan on the lower Truckee River.

The increased flood depths and flooded areas will result in additional damages, above that which would occur without the project. The adverse impact on streamflows would be strongly opposed by the downstream communities of Vista, Lockwood, Wadsworth, Nixon and the Pyramid Lake Indian Tribe who have historically opposed any projects that impact the lower Truckee River. The potential for lawsuits filed by these groups would present itself. Their opposition would seriously jeopardize the implementation of the project. The only complete plan would have to include mitigation measures along the lower Truckee River. Therefore, several methods were evaluated to address these impacts.

To address the impacts downstream, the various methods include: (1) extend project limits below the Truckee Meadows, including structural measures such as channel excavation or levees to accommodate the added flows, (2) compensate property owners affected by the added flows, (3) prevent any changes in flows downstream by modifying project features upstream.



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

DAMAGE REACHES
ON TRUCKEE RIVER
FROM VISTA TO PYRAMID LAKE

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 16

The first method would be to provide structural measures downstream. Volume quantities for a continuous channel excavation project from Vista to Pyramid Lake are presented in Table 20. These quantities only represent the excavation necessary to accommodate the increase in 100-year flows as a result of the channel/levee plan (3,600 cfs). With this level of excavation, downstream flooding during the 100-event would be the same as without the channel/levee project. The costs associated with the downstream excavation are also shown on Table 20.

Table 19

IMPACTS FROM THE 100-YEAR CHANNEL/LEVEE PLAN
ON THE TRUCKEE RIVER FROM VISTA TO PYRAMID LAKE

Reach	Preproject 100-Year Flood Plain (acres)	100-Year Flood Plain With Upstream Channel/ Levee Plan (acres)	Increase In Flooded Area	Average Increase in Flood Depths (feet)
1	860	930	7.9%	1.5'
2	1,400	1,590	13.4%	1.0'
3	1,100	1,170	6.5%	0.5'
4	770	830	7.9%	1.0'

TABLE 20

ESTIMATED CHANNEL EXCAVATION REQUIREMENTS FOR
TRUCKEE RIVER FROM VISTA TO PYRAMID LAKE

Reach	Average Channel Velocity (F/S)	Reach Length (FT)	Volume of Channel Excavation (CY)
1	8.3	60,600	1,450,000
2	10.6	89,700	1,890,000
3	6.4	62,700	1,490,000
4	7.1	74,900	1,760,000
Total		287,900	6,590,000

Estimated First Costs (October 1984 price level)	
Channel Excavation ($3.55/cy)	$23,400,000
Bank Protection ($200/LF) 1/	2,800,000
Land Easements	2/
Relocations	2/
TOTAL	$26,200,000

1/ Based on 5% of river from Vista to Pyramid Lake needing bank protection.
2/ No estimate made since costs to this point significantly exceeded cost of other methods.

Another method which could be used along the lower Truckee River is to purchase continuous flowage easements. The cost of the easements is determined by establishing the impact on the downstream property. Also, the cost is determined by the conditions and restrictions of the easements. In this case, the easements are based upon increased flooding associated with the channel/levee plan. Also, this easement will allow property owners to continue use of their property in its existing state, and future development can occur as long as it is consistent with the requirements of the Flood Insurance Program. That is, all new development will be built above or flood proofed above the 100-year flood plain. This type of easement represents a least restrictive arrangement and, therefore, would be least costly. Table 21 displays the associated costs. A more costly easement (at least 25 percent higher) would include acquisition and relocation of all improvements and strict land use controls.

The third method to address downstream impacts would be to prevent them by modifying structural features in the Truckee Meadows. By incorporating a detention basin into the overall plan, excess peak floodflows could be temporarily stored so that downstream flood peaks would remain essentially unchanged from without-project conditions.

Potential detention storage sites are indicated on Figure 17. All of the sites, with the exception of site 4, were determined to be infeasible because of the following: (1) high (in excess of 30 feet) embankment levee requirements, (2) limited storage capacity, (3) excessively long inflow channel requirements, and (4) their high costs.

Detention site 4 is located in the Truckee Meadows, primarily on University of Nevada Agricultural Experimental Station (UNAES) lands. For this site to function, stages in the river approaching the basin must be increased. This is accomplished by eliminating a majority of the excavation as required by the channel/levee plan and raising the levee heights along the river, thereby producing the required higher heads in the river and the storage capacity in the basin.

Specific modifications to the channel/levee plan by the addition of the detention basin include: (1) higher levees along Truckee River from McCarran Boulevard to downstream project limit (average 2-4 feet higher), (2) levees surrounding the detention basin, (3) 2 weirs and outlet structure, (4) flowage easements within the detention basin, and (5) reduction in excavation along the Truckee River. The overall impact in terms of costs would be a net increase of approximately $4.6 million to the total project. The added costs of higher levees and flowage easements are largely offset by the significant reduction in excavation requirements.

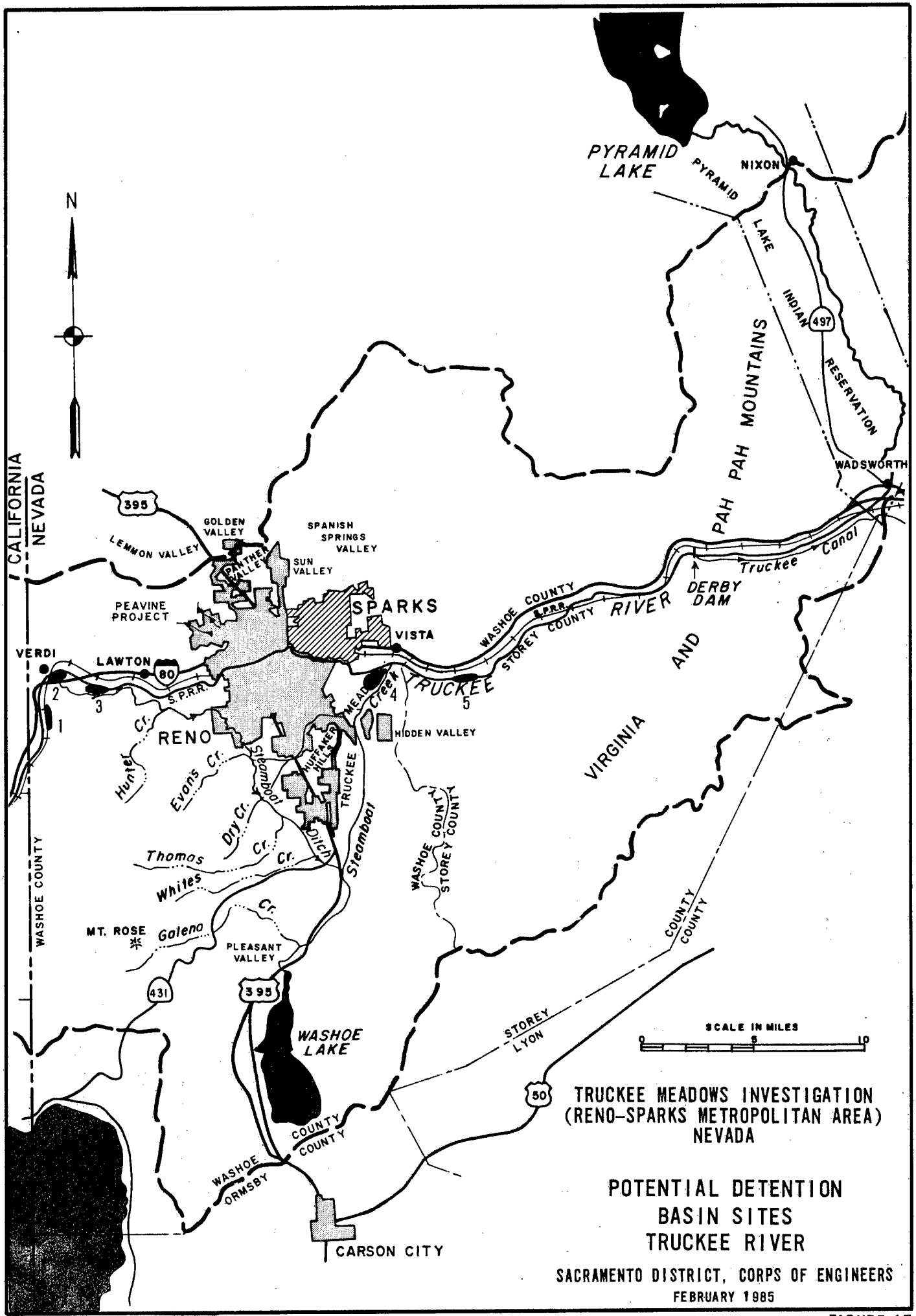
The three methods and their respective costs are summarized in Table 22. It is apparent that the detention basin method is more cost effective than either the channel excavation or easement approach and the data on Table 22A shows that the detention basin is close to being economically justified. Also, aside from the economic considerations, a number of other problems could develop with either the excavation or easement approach. If measures were proposed along the lower Truckee River, then the downstream communities would become potential project participants. The coordination effort would become very time consuming and difficult.

Table 21

ESTIMATED COSTS FOR FLOWAGE EASEMENTS
TRUCKEE RIVER FROM VISTA TO PYRAMID LAKE
(October 1982 Price Level)

REACH	AGRICULTURAL	FLOWAGE EASEMENT 1/			TOTAL
		INDUSTRIAL	COMMERCIAL	RESIDENTIAL	
1	$ 505,200	$2,023,000	$2,590,600	$4,555,400	$ 9,674,200
2	$ 514,100			$3,033,300	$ 3,547,400
3	$ 119,200			$1,329,300	$ 1,448,500
4	$ 137,900				$ 137,900
TOTAL	$1,276,400	$2,023,000	$2,590,600	$8,918,000	$14,808,000

1/ Flowage easements are based on lands, improvements, and facilities within the 100-year flood plain.



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

POTENTIAL DETENTION
BASIN SITES
TRUCKEE RIVER

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 17

Table 22

SUMMARY OF COSTS ASSOCIATED WITH MITIGATION
MEASURES FOR THE TRUCKEE RIVER FROM VISTA TO PYRAMID LAKE
(October 1982 Price Level)

Method	Estimated Added Costs
Protect with channel excavation	$26.2 Million
Compensate with easements	$14.8 Million
Prevent with detention basin	$ 4.6 Million

TABLE 22A

ECONOMIC SUMMARY OF MITIGATION MEASURES
FOR TRUCKEE RIVER FROM VISTA TO PYRAMID LAKE
(October 1982 Price Level)

Method	Annual Costs* ($1,000)	Annual Induced Damages Prevented ($1,000)	Benefit-Cost Ratio
Protect with Channel Excavation	2,683	503	.2
Compensate with Easements	1,260	0	-
Prevent with Detention Basin	418	363	.9

*includes costs for operation and maintenance with the exception of the Easement Method.

Also, it would be very difficult to reach any agreement on an acceptable plan for the lower Truckee River. The detention basin would provide a complete solution to the problem. It is for these reasons of coordination, support, implementability and economics that the detention basin was incorporated into the flood control plan.

The modification of the plan to include the detention basin has an additional positive aspect. The Fish and Wildlife Service and Nevada Department of Wildlife have expressed concern about significant channel excavation because of the resultant loss of riparian wildlife habitat and its relationship to fish habitat. The Fish and Wildlife Service has concluded that disturbance of river bottom habitat, alteration of riverbanks, and loss of riparian vegetation (as well as increased flows below Vista) would jeopardize the existence and recovery of the threatened Lahontan cutthroat trout and the endangered cui-ui in the Truckee River. Minimizing the amount of channel excavation in the proposed plan will alleviate most of their concerns.

2. Tributary Improvements.

a. Steamboat Creek, Boynton Slough, Dry Creek, and Evans Creek.

Design features from earlier studies included provision for 100-year protection to the Truckee River tributaries of Steamboat Creek, Boynton Slough, Dry Creek, and Evans Creek. The tributary improvements included channel and levee work for protection against cloudburst storms centered over the tributary basin.

In order to establish a Federal interest for Corps participation to develop flood control plans in an urban area, the flood discharge of the subject stream should be greater than 800 cfs for the 10 percent flood (one chance in ten of being equaled or exceeded in any given year) during the period of analysis (Engineering Regulation 1165-2-21). Subsequent study of the basin hydrology indicates that the flood discharge for the 10 percent event no longer exceeds 800 cfs for these tributary streams and, therefore, they no longer meet the Corps criteria. An exception may be granted in areas of hydrologic disparity producing limited discharges for the 10 percent flood but in excess of 1,800 cfs for the one percent flood. However, this condition does not exist. Accordingly, the plan was modified to provide only backwater levees along Steamboat Creek and the lower portion of Boynton Slough. The requirement for backwater levees was governed by the Truckee River design flows.

Given the current policies regarding Corps participation, any flood control plan for the tributaries would be a local responsibility. The following flood control plan was developed and is compatible with the Corps Truckee Meadows flood control plan. The plan could be implemented by local agencies.

The existing channel and levee system is incapable of passing the 100-year flow, in part due to insufficient bridge capacity. Any improvements would attempt to minimize any increase in levee heights over existing

conditions. Improvements would include development of a trapezoidal channel downstream of the outfall to lower McCarran Boulevard Bridge, where it would be integrated into the proposed Corps project.

Upstream of Boynton Slough outfall, the existing channel of Dry Creek steepens greatly. The channel upstream of the outfall to Virginia Street would be enlarged to a trapezoidal section. Due to the high velocity flows in this reach, the channel bottoms and sides would be lined with gabions. The Evans Creek channel would be similar to the Dry Creek channel from its mouth to Virginia Street.

If the plan proposed for Boynton Slough, Dry, and Evans Creek were not implemented, local flood problems would continue. However, the flood problems would not worsen as a result of the Truckee Meadows flood control plan.

The proposed plan for North Truckee Drain (NTD) provided a gated structure located at the mouth of NTD to prevent backwater from the Truckee River. Further analysis of this plan resulted in the addition of two 100 HP pumps to evacuate contributing NTD flows into the Truckee River.

The estimated cost for this plan is in excess of $2,000,000. An alternative plan for the North Truckee Drain would consist of backwater levees along North Truckee Drain from the Truckee River to high ground approximately 900 feet north of the I-80 crossing. The estimated cost for the levee plan is $620,000. It is apparent that the levee plan is more cost effective than the gate/pump plan and, therefore, was incorporated into the overall flood control plan.

3. Flood Events Exceeding Design Conditions.

The selected plan has been designed for 100-year level of protection. Floods exceeding the 100-year event could overtop levees or floodwalls and could be directed into areas that would not have flooded prior to project construction. Accordingly, the plan was modified to permit controlled overtopping with a combination of variable freeboard heights and side spilling weirs embedded in the protective works. The weirs or breakout structures would be located and sized so that during above-design events, controlled flows would spill into overbank areas that would have flooded without the project. This controlled flooding would insure that a catastrophic situation would not occur and that the project would not worsen flooding for flood events greater than project design flows.

The analytical technique used in sizing the breakout structures involved an iterative process of: (1) determining the breakout structure length based on the peak preproject breakout discharge at each breakout location; (2) routing the entire SPF hydrograph through the study reach; and (3) based on the SPF routing, adjusting each breakout structure length so that the peak breakout discharge and breakout volumes do not exceed the preproject values in a given stream reach. (The peak breakout discharge under project conditions at a given breakout location may be greater than the peak under preproject (existing) conditions. This is due to the improved floodway capacity with the project improvements. However, the sum of the breakout discharges and volumes for each subreach under project conditions is less than the sum under preproject conditions.)

Computer program HEC-2, "Water Surface Profiles," was used to compute water surface profiles in the project channels for a range of discharges by the Standard Step Method. A project condition data set was used which included all project features, including proposed levees, floodwalls, channel excavation and bridge replacements. The channel encroachment option of the HEC-2 program was used to confine all flows to the floodway by creating vertical walls in the geometric data set. Based on the computed water surface profiles from HEC-2, stage-discharge rating curves were developed for the project floodway at each preproject breakout location.

The next step involved manually routing the SPF hydrograph through the study reach starting at the upstream limit using the Modified Puls routing method. At each preproject breakout location, the breakout structure length was sized and its stage discharge rating curve was developed, assuming that the structure acts similar to a broadcrested weir, for which:

$$Q = cLH^{1.5}$$

$$L = \frac{Q}{cH^{1.5}}$$

or

Where

L=breakout structure length (feet)

Q=peak breakout discharge (cfs)

c=coefficient of discharge

H=energy head on crest (feet)

The peak breakout discharge was initially assumed equal to the peak preproject breakout discharge. The crest elevation of each breakout structure was assumed to be 1 foot above the design water surface elevation. H, energy head on crest, was assumed to be that for the flow upstream of the breakout location (based on the stage-discharge relationship from the HEC-2 runs). The peak floodway discharge downstream of each breakout was computed as the peak upstream discharge less the peak breakout discharge. Breakout discharges were assumed lost from the floodway.

Next, the SPF hydrograph was routed through the project condition model with breakout flows leaving the main floodway at the predetermined breakout locations. Breakout discharges were computed for each time interval based on the computed stage discharge relationship for the assumed initial breakout structure lengths. Breakout volumes over the entire hydrograph were summed and routed through the adjacent flood plain to determine depths and duration of ponding behind project levees. Based on these data, breakout structure lengths were adjusted and additional hydrograph routings were performed until the design objective of the structures were met.

A final manual routing was performed to verify the SPF hydrograph developed by computer program HEC-1 "Flood Hydrograph Package". The HEC-1 routing was used to verify the peak breakout discharge and total breakout volume at each breakout location and peak floodway discharge by subreach and

between breakout locations. HEC-1 was also used to sum and route breakout flows over the flood plains adjacent to the project floodway and to verify depths and duration of ponding behind project levees.

Computer program HEC-2 was used to compute the SPF water surface profile through the project floodway, assuming the peak floodway discharges from the manual and HEC-1 routings and fully confined flows. The results indicated that at some locations, the computed water surface profile would exceed the project levee/floodwall freeboard determined for the design event.

Modifications to the project design to ensure that the project would not fail or induce flooding during the SPF event included: the addition of breakout structures to permit excess flows during the SPF event to safely leave the project floodway and raising of project levees and floodwalls to fully contain floodflows between breakout structures. Both of the above modifications are necessary to ensure that project levees and floodwalls would not be overtopped.

Breakout flows north of the river would pond to an elevation of about 4396 $\pm$ feet downstream of McCarran Boulevard Bridge and behind the project levees. Breakout flows south of the river would pond to an elevation of about 4400 feet behind the Boynton Slough and University Farms Detention Basin levees. These SPF ponding elevations are equal to or less than the preproject levels. Levees along Boynton Slough and the detention basin adjoining the south bank ponding area will be raised above the project design level to elevation 4400 feet to prevent overtopping and fully contain the ponded breakout discharges.

4. Analysis of Interior Drainage.

An essential element in plan formulation is the analysis of interior drainage in the study area. Features of the proposed flood control plan could affect drainage of certain interior areas. An analysis was made to identify potential project impacts on interior drainage and various solutions were formulated to alleviate these impacts.

The following steps were used to determine impacts of project features on interior drainage:

1. Review existing hydrology and develop hydrologic data relevant to existing interior drainage conditions.

2. Determine any project induced impacts.

3. Formulate interior flood control solutions to solve these impacts.

4. Evaluate each solution and select the most effective, feasible solution.

5. Determine if any residual impacts exist after implementation of solution.

Existing interior drainage is dependent upon the capacity of existing storm drain systems and the amount of overland flow produced by the storm in a particular area. In the cities of Reno and Sparks, existing storm systems have been designed to handle interior drainage from storm runoff. The City of Reno system is designed for the 5-year flow. In downtown Reno, water entering the storm drain system eventually drains through culverts into the Truckee River. The City of Sparks system is designed for the 10-year flow. In Sparks, a portion of the interior runoff enters the Truckee River through a system of culverts. The main conveyance system for interior drainage is the North Truckee Drain (NTD). As these different storm drain systems become submerged, excess runoff accumulates at the storm drain inlets and begins to flow overland towards the river.

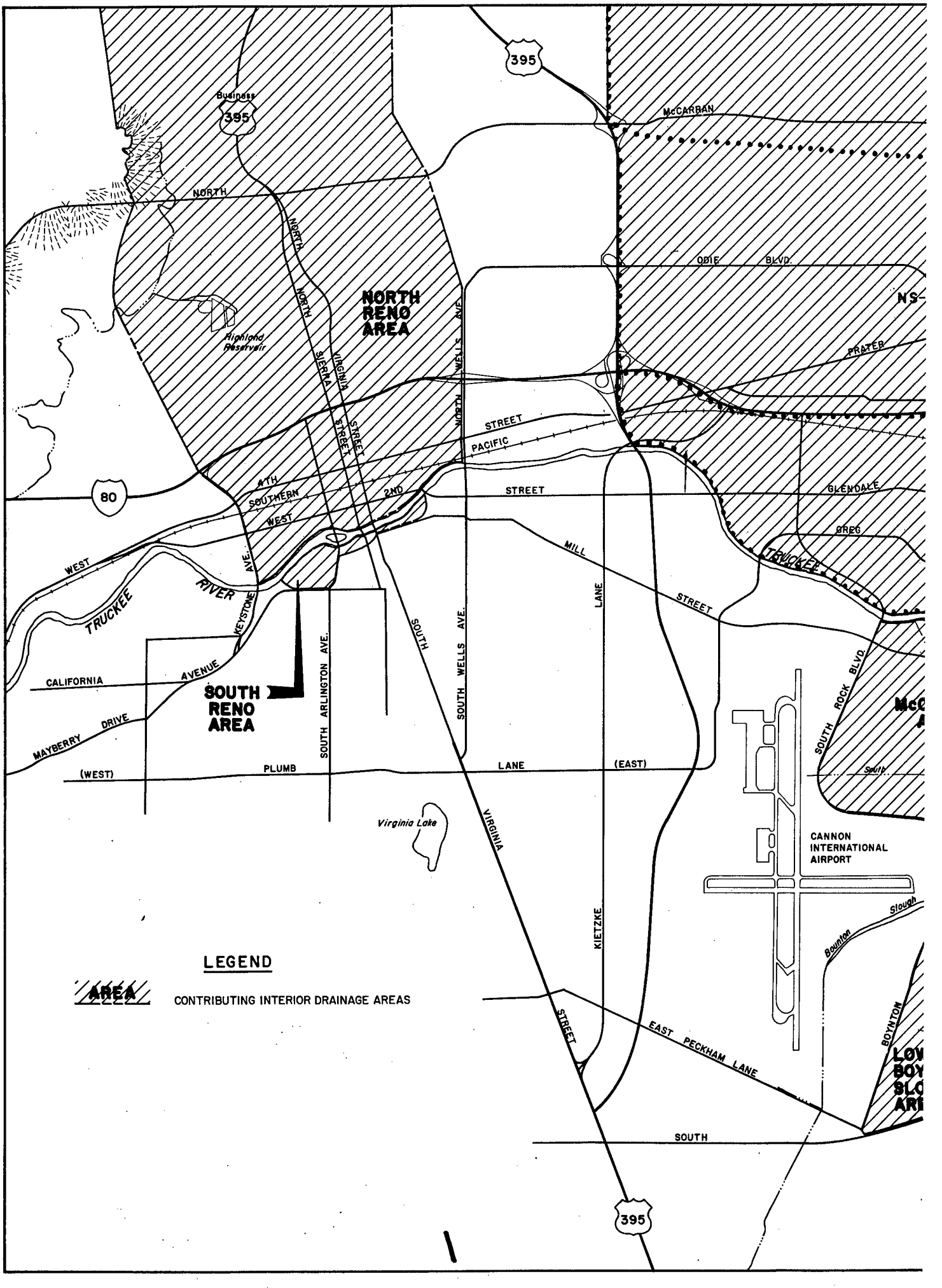
Seven interior areas within the project area may be affected by the project. They are listed below and shown on Figure 18.

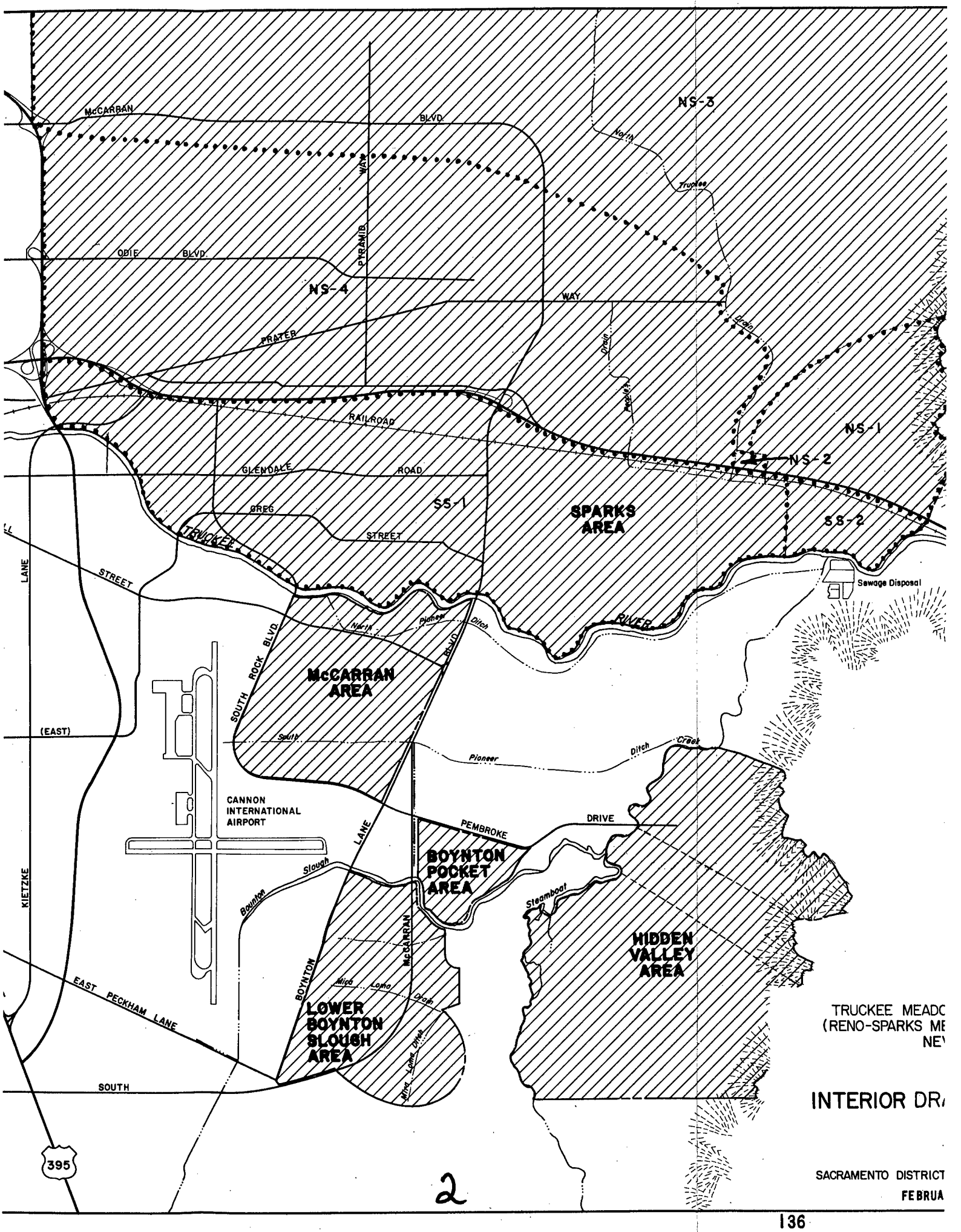
AREA	CONTRIBUTING DRAINAGE AREA (sq. mi.)
South Reno	0.11
North Reno	8.4
Sparks	31.9
McCarran	1.4
Boynton Pocket	0.22
Lower Boynton Pocket	1.4
Hidden Valley	3.75

Three specific local storms were analyzed to determine interior drainage patterns. The storms chosen were the 100-year and SPF cloudburst storm centered over each specific interior area, and the 100-year general rain storm centered over the Reno-Sparks Metropolitan area. Each specific local storm was routed through the affected storm drain system, terminating at the Truckee River. The cloudburst storm resulted in the most severe runoff condition and was used to evaluate project impacts on existing interior drainage. Figure 19 displays the flood plain that would occur during the 100-year cloudburst storm centered over each area for preproject conditions. The same storm was evaluated at each area for project conditions to determine if the project produced any additional impact on the flood plain.

A third storm, the 100-year general rain design storm, which was centered over Lawton, Nevada, was also used to evaluate interior drainage. This storm was used as a basis for project design from Truckee River flooding. Interior drainage runoff was evaluated at each of the seven areas to determine any project related impacts. Interior drainage ponding could also occur during the design storm preproject condition and is included in the preproject flood plains shown on Plate 3.

In several areas, project features impact on existing interior drainage patterns during the specific 100-year and SPF cloudburst storms. In these areas, interior flood control features were added to the project to insure that existing drainage patterns would not be altered and existing conditions would not be aggravated by the project. These features include culverts with flapgates placed in the project features.


395
Business
395
McCARRAN
NORTH
ODIE BLVD.
NORTH RENO AREA
Highland Reservoir
NORTH SIERRA STREET
VIRGINIA STREET
NORTH WELLS AVE.
PRATER
STREET
PACIFIC
4TH
SOUTHERN
2ND
STREET
GLENDALE
80
WEST
WEST
TRUCKEE
RIVER
KEYSTONE AVE.
MILL
STREET
TRUCKEE
GREG
SOUTH ROCK BLVD.
CALIFORNIA
AVENUE
SOUTH RENO AREA
MAYBERRY
DRIVE
SOUTH ARLINGTON AVE.
SOUTH WELLS AVE.
LANE
(WEST)
PLUMB
LANE
(EAST)
Virginia Lake
VIRGINIA
CANNON INTERNATIONAL AIRPORT
Slough
Boynton
KIETZKE
STREET
EAST PECKHAM LANE
BOYNTON
SOUTH
395
LEGEND
AREA
CONTRIBUTING INTERIOR DRAINAGE AREAS


McCARRAN BLVD.
NS-3
North Truckee Drain
PYRAMID WAY
ODIE BLVD.
NS-4
PRATER WAY
Ditch
Peppler
RAILROAD
NS-1
NS-2
GLENDALE ROAD
OREG
SS-1
SPARKS AREA
SS-2
TRUCKEE STREET
Sewage Disposal
LANE
STREET
North Pioneer Ditch
RIVER
SOUTH ROCK BLVD.
McCARRAN AREA
(EAST)
Spitz
Pioneer Ditch
Creek
CANNON INTERNATIONAL AIRPORT
PEMBROKE DRIVE
LANE
BOYNTON POCKET AREA
KIETZKE
Boynton Slough
Steamboat
HIDDEN VALLEY AREA
BOYNTON
McCARRAN
Mira Loma Drain
EAST PECKHAM LANE
LOWER BOYNTON SLOUGH AREA
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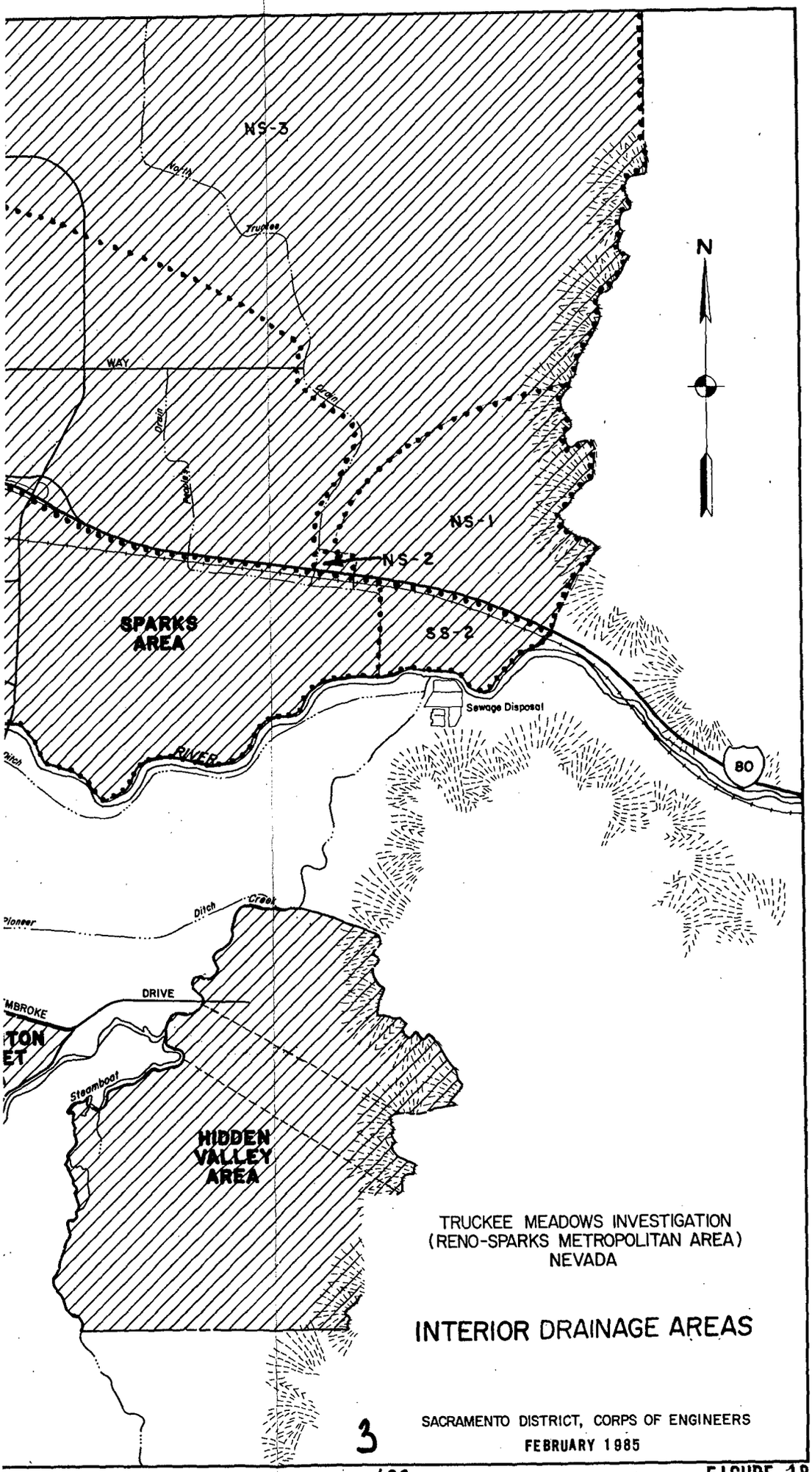
NS-3
North
Truckee
WAY
drain
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Rattlesnake
NS-1
NS-2
SS-2
SPARKS AREA
Sewage Disposal
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Ditch
80
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Pioneer
Ditch
Creek
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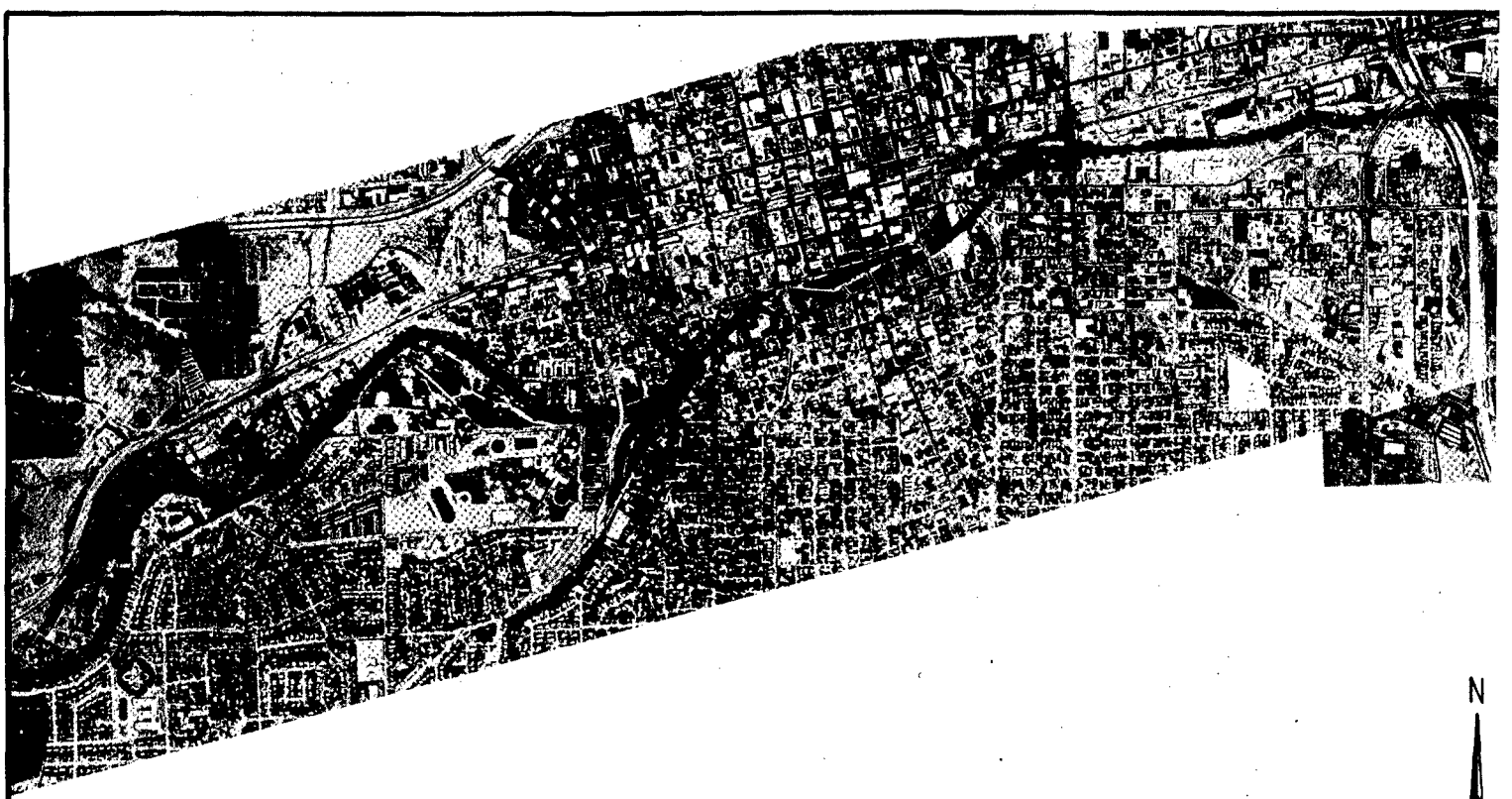
Steamboat
HIDDEN VALLEY AREA
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
INTERIOR DRAINAGE AREAS
3
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 18



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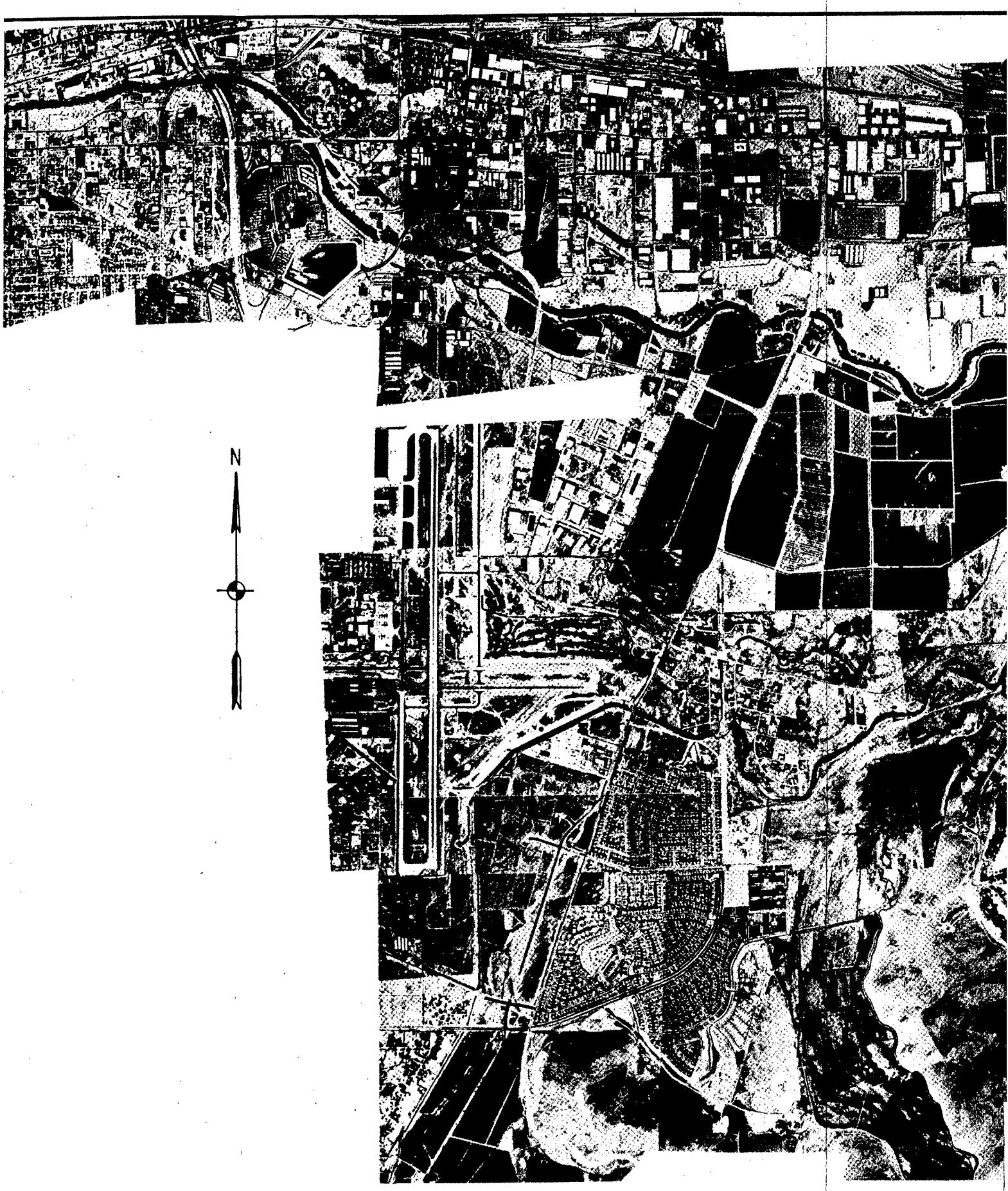
LEGEND

PONDING AREAS



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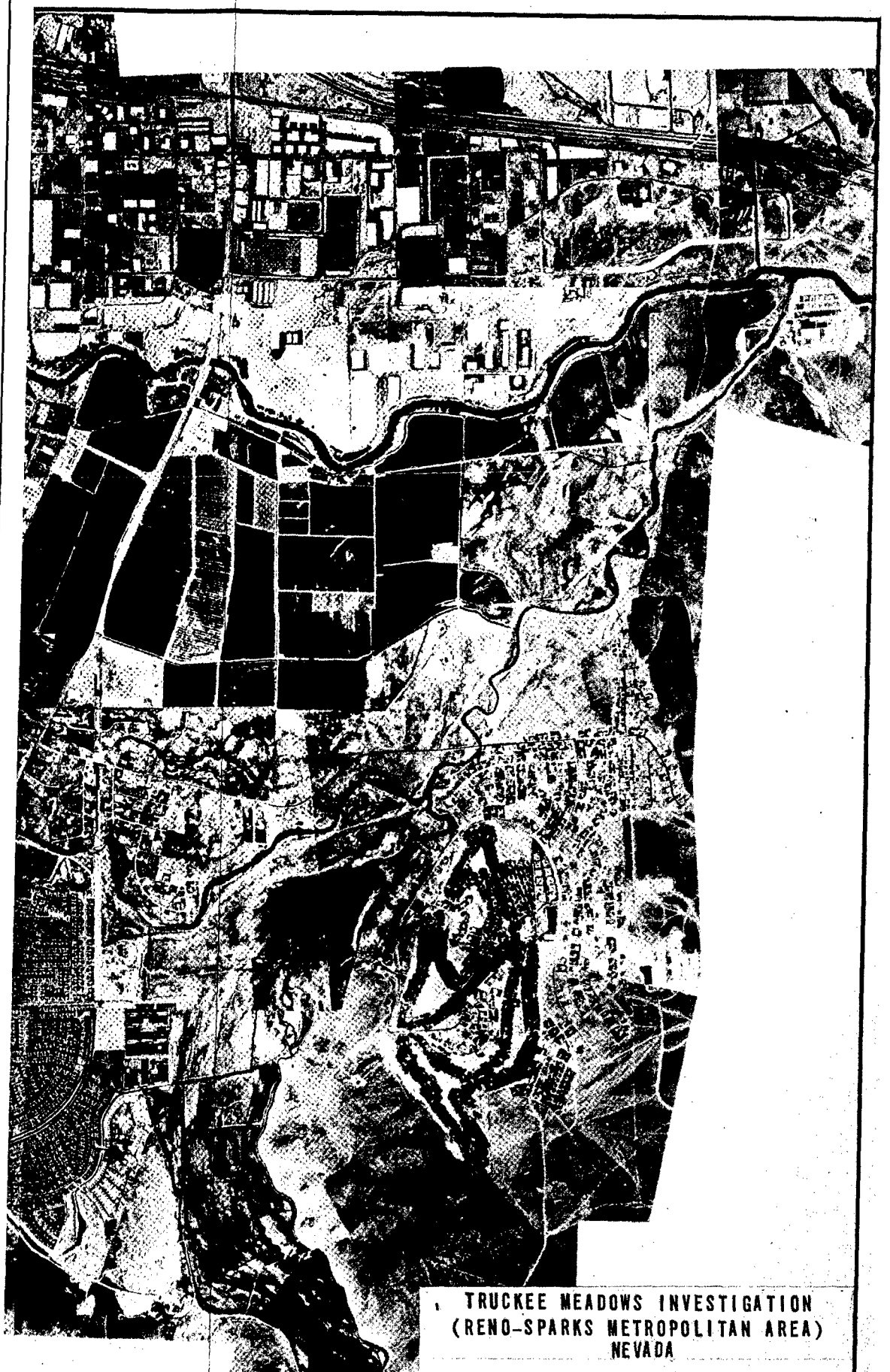


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

**100-YEAR CLOUDBURST
FLOOD PLAIN
PREPROJECT CONDITIONS**

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 19

After the project was modified to accommodate the 100-year cloudburst storm, residual flooding from the SPF cloudburst storm was identified and additional features were included as appropriate. Finally, modifications were made to accommodate the 100-year general design storm when flood control facilities impacted on interior drainage. The specific additions and modifications to each area for interior flood control are described below.

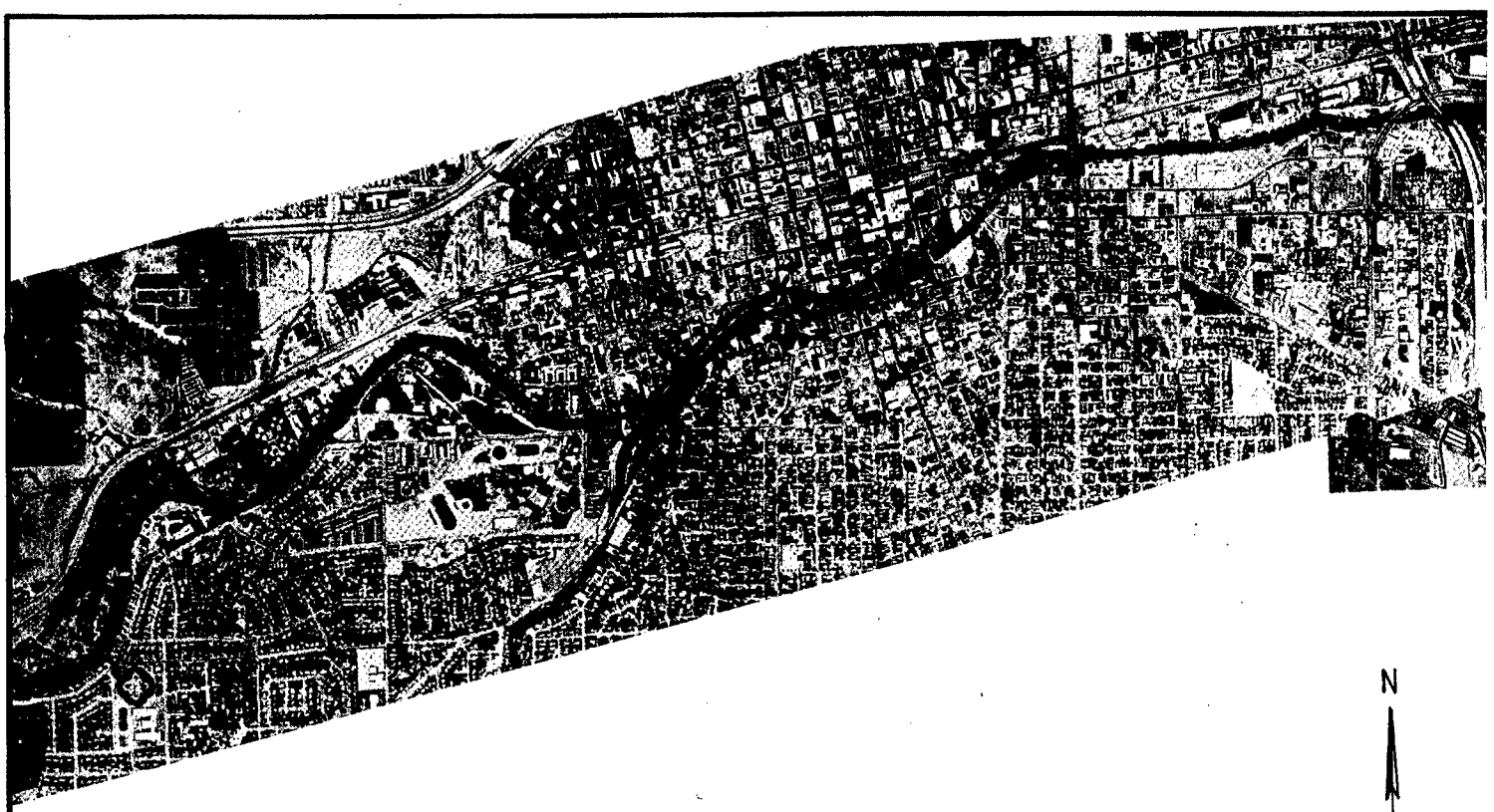
South Reno Interior Drainage. - When runoff exceeds the storm drain capacity, overland flow will enter this area from the south and west. Once near the river east of Booth Street, runoff will move east along the floodwalls and create a nuisance flooding condition limited to the streets and gutters for the 100-year and SPF cloudburst, and the general rain design storm in this area. After the overland flow passes Lake Street, it will enter the river directly without ponding. Project features will not affect the runoff pattern in this area; therefore, no interior flood control features are necessary. Figure 20 presents the 100-year design storm interior drainage flood plain.

North Reno Interior Drainage. - When Reno's storm drain system is exceeded by high storm runoff, the overland flow entering North Reno splits into three directions. A portion goes to the east of Lake Street and flows directly into the river. A portion enters the area between Keystone and Arlington Boulevard. This water flows behind the existing berm and joins the flood water entering between Arlington Street and Lake Street. Water in this central area can pond behind the floodwall but will eventually drain through the existing culverts and into the river. Ponding in this area would be in the streets, parking lots, basements, and, depending on the depth, first floors of buildings in the block along the river. If ponding exceeds 1 foot, flows will overtop the floodwall and enter the river.

During the 100-year and SPF preproject cloudburst storm, some ponding occurs in the central area. Project modifications including culverts sized to SPF capacity with flapgates to allow the area to drain will preclude additional drainage problems due to the project. Project flooding will be insignificant and limited to streets and gutters.

During the 100-year design storm under project conditions, runoff is conveyed by the storm drain system into the river, and river stages will not preclude drainage through the culverts. Therefore, additional interior flood control features are not required in this area.

Sparks Interior Drainage. - Within the Sparks system, overland flow created by storm runoff will occur in two major areas. One area is north of the I-80 freeway and is drained primarily by the North Truckee Drain (NTD). The NTD passes under the freeway and runs south to the river. Also, as shown in Figure 18, this north area is subdivided into four smaller areas - NS1, NS2, NS3, and NS4. Area NS1 is drained south to the Truckee River by the existing storm drain system. NS2 and NS3 drain into NTD. NS4 drains into Peoples Drain. Flows exceeding the drain capacity north of the freeway, will pond against the freeway. The second area is south of the freeway and can be subdivided into two areas; SS1 is drained by the existing storm drain system terminating at the river. Drainage of SS2 occurs easterly to the Truckee River. Excess water will pond in these areas when flows exceed the culvert capacities. Initially, water would pond in the streets and parking lots and eventually pond against the existing levee. Ponding can also occur in the



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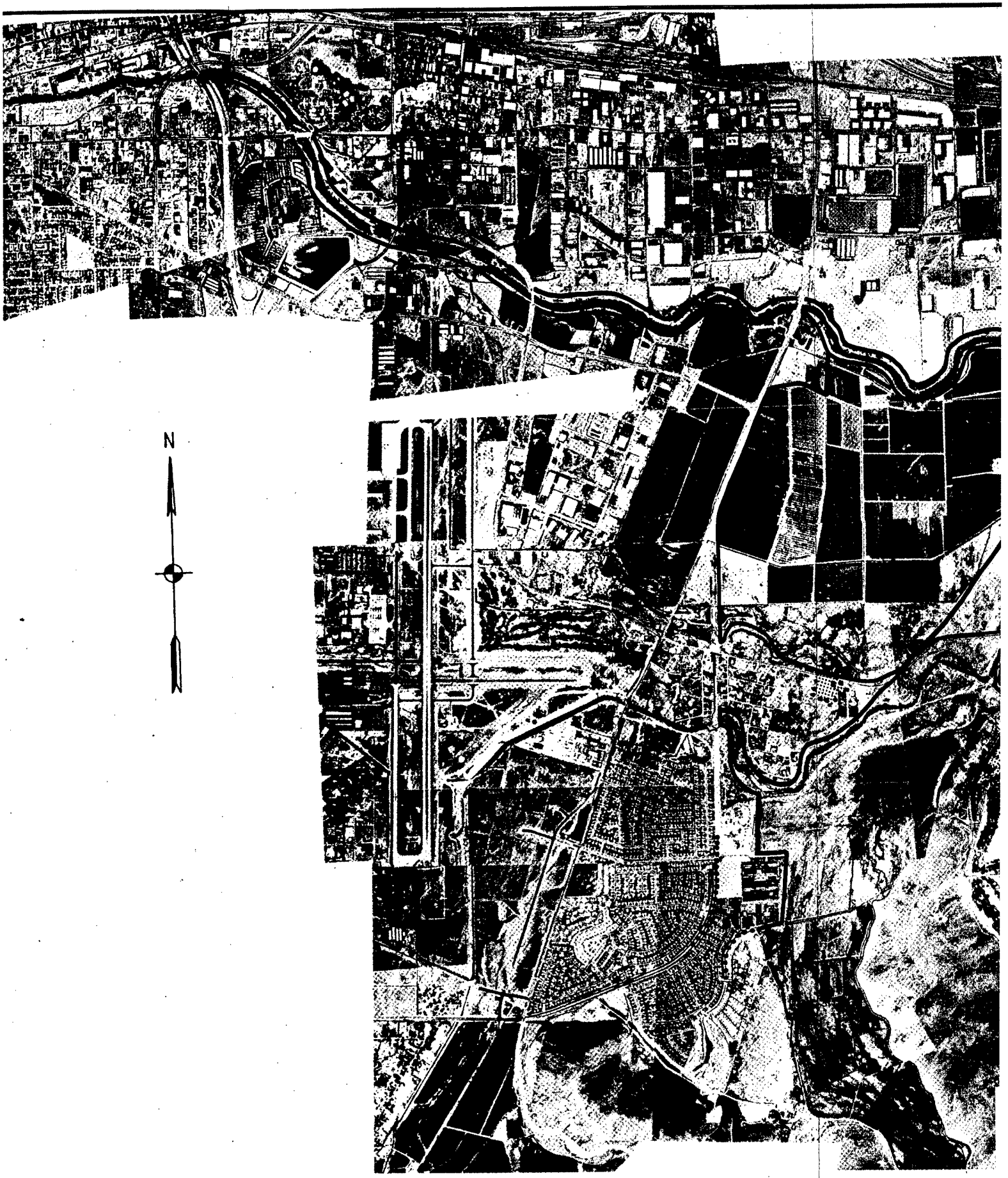
LEGEND

FLOOD CONTROL FEATURES

PONDING AREAS



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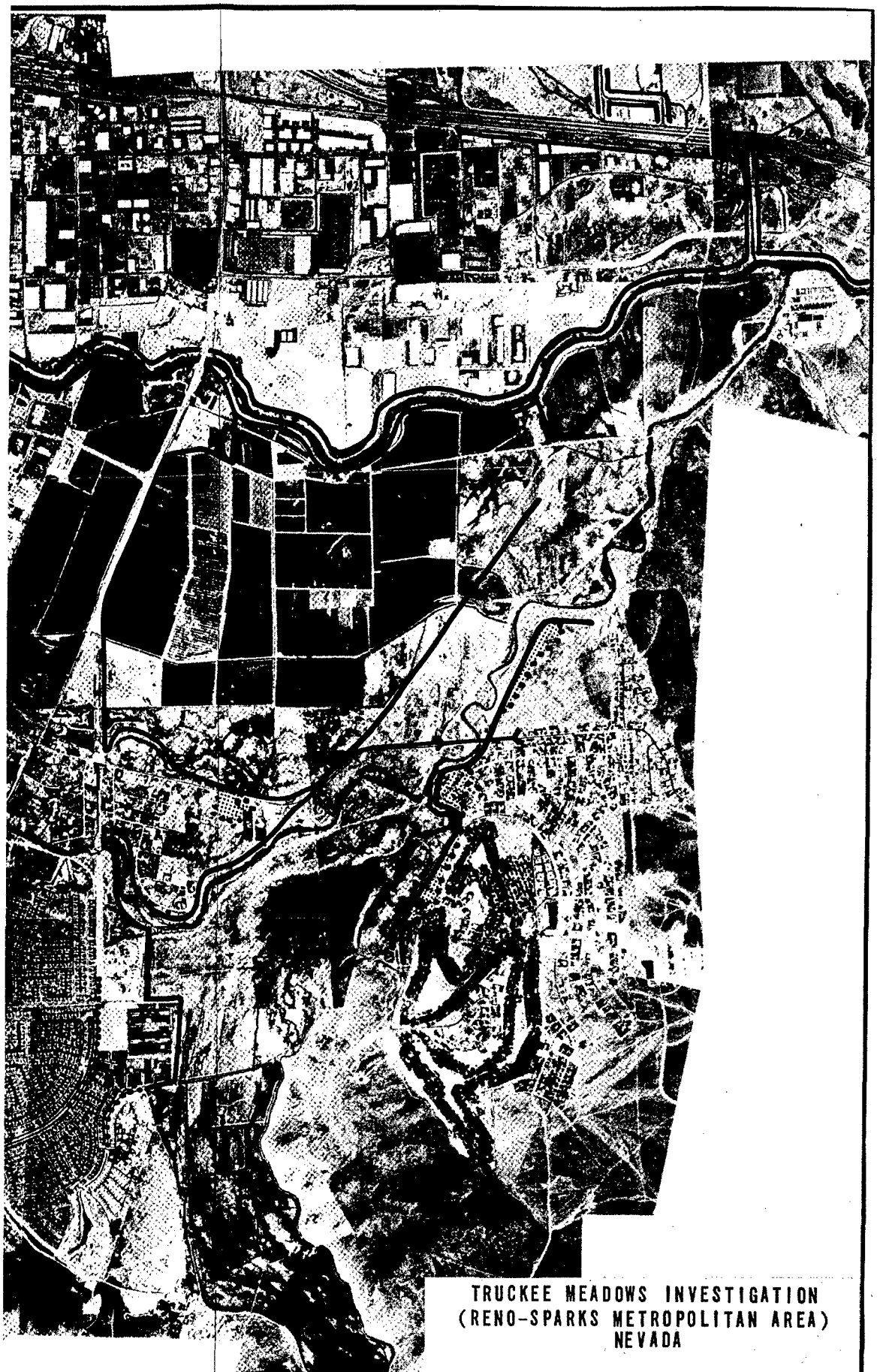


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

**INTERIOR DRAINAGE
PONDING DURING
DESIGN STORM**

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 20

south area when river stages exceed elevation 4385.5 feet, and the resultant backwater in the NTD overtops the existing NTD levee (low point = 4385.5).

With a 100-year cloudburst storm centered over the area, ponding is minimal in both areas in south Sparks, and is limited to the streets and gutter systems. With an SPF cloudburst event ponding will amount to about 250 acre-feet and 1.5 feet in SS1. The ponding occurring in south Sparks is not affected by the project features and is a local drainage problem. Development of a ponding area or additional culverts would be a local responsibility and could be incorporated into the project. North of the freeway, storm runoff from 100-year and SPF cloudburst storms will exceed the capacity of NTD, and will result in ponding in area NS3. In areas NS1, NS2, and NS4, some nuisance flooding will occur due to local runoff exceeding the storm drain capacity. Under project conditions, cloudburst drainage in SS1 and SS2 will not be affected. For areas NS1 and NS4, project features will not alter interior drainage as drainage within this area is away from backwaters on NTD. Runoff in area NS2 under project conditions is from direct rainfall only, which is insignificant; therefore, interior flooding is minimal. Drainage within area NS3 would not be affected; new areas would not be flooded, and ponding would not be altered.

The 100-year design storm produces residual ponding of 104 acre-feet to a maximum depth of 1.3 feet in the south Sparks area SS1. This ponding is due to high stages on the Truckee River during project operation which will affect drainage through the culverts. The ponding will be limited to streets and parking lots and will not cause damage to the industrial area. Runoff in area SS2 would be due to direct rainfall and is insignificant. Project features will not aggravate the drainage in the two south Sparks areas. Runoff in areas NS1, NS2, NS3, and NS4 is due to direct rainfall and would not cause a flooding problem.

McCarran Interior Drainage. - Storm runoff enters this area and travels eastward. Storm runoff is directed towards McCarran Boulevard which acts as a barrier. This runoff eventually passes under McCarran Boulevard by the North and South Pioneer Ditches. Water ponding in this area is limited to agricultural land. Additional runoff north of Mill Street can drain to the north and east into the river.

The flood control levee along the south bank of the river west of McCarran Boulevard will block drainage to the Truckee River. Two culverts with flapgates sized for the SPF cloudburst event placed along the levee in this reach would permit drainage to the river and would maintain preproject ponding levels in this area. As for the area near the North and South Pioneer Ditch site, both preproject and project condition ponding would be the same. 100-year cloudburst ponding would last approximately 9 hours, with a maximum volume of about 30 acre-feet along McCarran Boulevard near the South Pioneer Ditch. This water would pond to a maximum depth of 3 feet, and would be limited to agricultural land, producing insignificant damage. Ponding for an SPF cloudburst storm would be about 126 acre-feet. If the ditch openings under McCarran were enlarged, much of this ponding would be alleviated. This would be a local responsibility.

Ponding to a maximum depth of about 1 foot, with a total volume of about 4 acre-feet would occur during the 100-year design storm under project conditions and is due to the high stages within the detention basin during project operation. This area would normally drain through culverts with flapgates into the detention basin area. The ponding is limited to agricultural lands. Possible interior flood control alternatives include (1) purchase flowage easements, (2) enlarge both North and South Pioneer Ditches and construct an additional storage ditch between them, and (3) construct a storage-diversion ditch on the east side of McCarran Boulevard from South Pioneer Ditch to Boynton Slough between McCarran Boulevard and the project levee.

Estimated first costs for the three alternatives are:

(1)	Flowage easement purchase	$875,000
(2)	Ditch enlargement and connector ditch (west side)	$272,000
(3)	Ditch between McCarran Boulevard and project levee	$ 43,000

The significant difference in costs between alternatives 2 and 3 is due primarily to the real estate requirements. Alternative 2 requires more land than alternative 3 due to the required alignment of the ditch producing a higher real estate cost. Alternative 3 was selected as the most feasible solution and was incorporated into the selected plan. With this modification, interior drainage flooding in this area will be eliminated. This feature will also eliminate ponding during the cloudburst storm.

Boynton Pocket Interior Drainage. - Storm runoff enters this area only from direct rainfall. It then flows overland and into Boynton Slough. Ponding in this residential area would be limited to the streets and gutters for the 100-year and SPF cloudburst.

The project levee would block the existing flow pattern. Consequently, two culverts with flapgates would be placed along the east levee to provide drainage into Boynton Slough. No ponding would occur during this storm.

Under project conditions, nuisance flooding would occur and be limited to the streets and roadway system. No additional interior flood control features are required.

Lower Boynton Slough Interior Drainage. - All overland flow enters this area and exits through the Mira Loma Drain-McCarran Boulevard system, which was designed to carry storm runoff.

During the 100-year and SPF cloudburst storms, runoff will be drained into Steamboat Creek. Culverts with flapgates will be placed in the project levee to maintain existing drainage.

During the 100-year design storm under project conditions, some ponding will occur due to high stages within the Steamboat Creek overflow area. However, Mira Loma Drain and McCarran Boulevard will be able to contain the ponded water. No additional interior flood control features are required.

Hidden Valley Interior Drainage. - Runoff entering this area flows into three subareas before entering Steamboat Creek. Runoff entering the area north of Pembroke Drive and south of the central area drains directly into Steamboat Creek. These two areas are primarily undeveloped rangeland. Water entering the central area will pond behind an existing levee and drain slowly by an existing culvert into Steamboat Creek. The ponding in this residential area encompasses several homes and a street. These homes are raised out of the FIA 100-year flood plain.

During the 100-year and SPF cloudburst storm, ponding occurs only in the central area and is limited to streets, driveways, and yards. The project levees would block the existing flow pattern. Sixteen culverts with flapgates were placed in the north levee to allow drainage to Steamboat Creek. Twenty culverts with flapgates were placed along the south levee. Four culverts with flapgates were placed in the central section, to replace the existing culvert. All culverts will have SPF capacity. After project completion, no ponding will occur in these areas during the cloudburst storm.

Some ponding would occur in all three areas during the 100-year design storm, due to high flow in Steamboat Creek overflow area preventing drainage through the culverts. The flooding in the central area would be limited to streets, driveways, and yards. The other two areas are primarily rangelands where flooding would be for a relatively short duration (under 72 hours) and damage would not be significant. The ponding in these areas would be along the landward side of the levee. A flowage easement could be purchased to allow for occasional flooding. Another alternative would be to align a ditch along the landward side of the levee to convey runoff to the north end of the levee system where it could pond and eventually drain into Steamboat Creek. The ditch alignment was chosen because it would prevent any ponding in the existing residential area. An easement would be necessary for the ponding area at the north end of the levee. Estimated first cost for this feature is $206,000.

Summary of Interior Drainage Analysis. - Table 23 presents a summary of project additions and modifications related to interior flood control.

5. Summary of Development of Selected Flood Control Plan. - Through this evolution process, the basic plan has progressed through several changes.

a. Evaluate downstream impacts.

Result - Detention basin incorporated into plan to reregulate flows and keep project flows essentially the same as existing flows.

b. Major tributary improvements no longer qualify for Corps assistance.

Result - Only backwater levees provided on tributaries.

c. Considerations for events exceeding project design.

Result - Flows in excess of design allowed to overflow at selected locations consistent with preproject conditions.

INTERIOR FLOOD CONTROL FEATURES AND MODIFICATIONS

INTERIOR DRAINAGE AREA	INTERIOR FLOOD CONTROL FEATURE
South Reno	Extend existing culverts/flapgates through floodwall.
North Reno	Extend existing culverts/flapgates through floodwall.
Sparks	Extend existing culverts/flapgates through floodwall. Existing North Truckee Drain and People's Drain.
McCarran	Place culverts/flapgates in levee on south bank of Truckee River west of McCarran Boulevard. Existing North and South Pioneer Ditches. Create temporary storage diversion ditch between McCarran Boulevard and project levee extending south to Boynton Slough.
Boynton Pocket	Place culverts/flapgates in east project levee.
Lower Boynton Slough	Extend ditches with culverts/flapgates through project levee. Existing Mira Loma Ditch and Mira Loma Drain
Hidden Valley	Place culverts/flapgates in project levee. Construct ditch along levee and purchase flowage easement at north end of levee.

d. North Truckee Drain backwater problems.

Result - Backwater levees added to prevent backwater flooding.

e. Interior flood control features necessary.

Result - Features added to prevent additional interior flooding as a result of project features.

6. NED Justification of Refined Flood Control Plan - In order to ensure that the refined (100-year level) plan would continue to be the NED plan, a comparison was made by incorporating similar project features to the 60-year plan. Modifications to the 60-year plan included overflow structures along levee and floodwall features, additional channel excavation, and the detention basin. No modifications were required in downtown Reno as the existing level of protection is 60-year. Table 23A displays the economic summary of the two plans which confirms the 100-year plan as the NED Plan.

TABLE 23A

ECONOMIC COMPARISON

OF REFINED PLAN FOR 60 YEAR AND 100 YEAR LEVEL OF PROTECTION

TRUCKEE MEADOWS INVESTIGATION

(8-3/8 INTEREST RATE, 1984 PRICES)

Level of Protection	First Cost ($1,000)	Annual Cost * ($1,000)	Average Annual Benefits ($1,000)	Net Benefits	B/C Ratio
60 year	$52,034	$ 4,567**	$ 6,885	$ 2,318	1.51:1
100 year	$70,200	$ 6,116**	$ 9,717	$ 3,601	1.59:1

* Includes costs for operation and maintenance.
** Excludes $310,000 for cultural resources mitigation costs.
*** Excludes $400,000 for cultural resources mitigation costs.

I. FORMULATION OF RECREATION PLAN

1. Previous Recreation Plans.

The recreation potential of alternative plans was investigated and coordinated with concerned agencies and the public. Various recreation plans developed during earlier studies were reviewed. These recreation plans were designed for the alternative flood control plans and featured development associated with reservoir and levee systems. The recreation plan for upstream alternatives included day-use areas, day-use camping areas, and bicycle, hiking/equestrian trails along the north bank of the Truckee River and at Steamboat Creek and Boynton Slough. The recreation plan for channel alternatives from downtown Reno to Vista included day-use areas, day-use camping area, and bicycle, equestrian/hiking trails. The recreation plan for levee alternatives from downtown Reno to Vista included day-use areas, day-use camping area, and bicycle, equestrian/hiking trails along the levees of the Truckee River, Steamboat Creek, and Boynton Slough.

2. Project Potential for Recreation.

As the selected flood control plan evolved, the analysis of the need for and opportunities for recreation development was revised. The selected flood control plan will create potential for increased public access and recreation development in the project area along the Truckee River, Steamboat Creek, and Steamboat Marsh. The flood control facilities will require maintenance access areas and interests in lands. This will assist in developing water-oriented recreation facilities.

3. Criteria for Selecting Recreation Facilities.

Criteria to identify potential recreation facilities were developed by reviewing actions recommended by concerned public agencies, past studies and plans, and the current inventory of recreation presently offered to the public.

The following criteria were applied in selecting sites and identifying facilities:

- Provide for recreation opportunities created by the flood control features.
- Complement existing recreation facilities in the local area.
- Be accessible to public roads.
- Minimize conflicts with existing land uses, including landowners' activities.
- Be dispersed throughout the project area.
- Encourage cooperative development of commercial and public facilities along the water.
- Maintain open space, and preserve and protect the esthetic quality.
- Minimize competition with private enterprise.
- Assist in meeting identified recreation deficiencies and needs in local area.
- Minimize impacts to endangered species, significant fish and wildlife habitat areas, and historic and archeological resources.
- Be compatible with existing and proposed recreation plans of others in the area.

- o Be closely tied to project area and flood control plan (levee and floodwall design and location).
- o Be closely tied to the fish and wildlife mitigation and enhancement plan.
- o Comply with Corps policy; i.e., recreation use and development will be on lands acquired for flood control purposes except as required for access, parking, potable water, sanitation, and related developments for health and safety; Federal recreation costs will be limited to 10 percent of total Federal project cost.

4. Coordination.

The Corps of Engineers coordinated with Federal and non-Federal agencies having possible interest in recreation development associated with the flood control project. Agencies were solicited for current and future recreation data used to develop the recreation plan described in the next section. Agencies contacted were U.S. Fish and Wildlife Service (FWS); State of Nevada Department of Wildlife; City of Reno Planning Department and Department of Parks and Recreation; consultants for City of Reno: Omni-Means Ltd., and Design Concepts West; City of Sparks Public Works Department; and Washoe County Department of Parks and Recreation.

Preliminary concepts for recreation and fish and wildlife enhancement were coordinated with the above interests in December 1982. The recreation plan described in this report reflects recommendations of the various agencies. Flood control features originally extended farther upstream along the Truckee River to the vicinity of North McCarran Boulevard.

5. Compatibility of Corps Recreation Plan with Existing and Planned Projects.

Creating a recreation plan consistent with local needs required extensive coordination with existing and planned projects. The Corps' recreation plan is compatible with and can be integrated into the existing recreation policies and the following local recreation plans. Table 24 describes the major planned public recreation access by others. Figure 21 locates these areas and paths connecting them. Local plans currently under consideration have been previously discussed in section D of this chapter, Plans of Others.

J. FORMULATION OF FISH AND WILDLIFE ENHANCEMENT PLAN

1. Previous Fish and Wildlife Enhancement Plans.

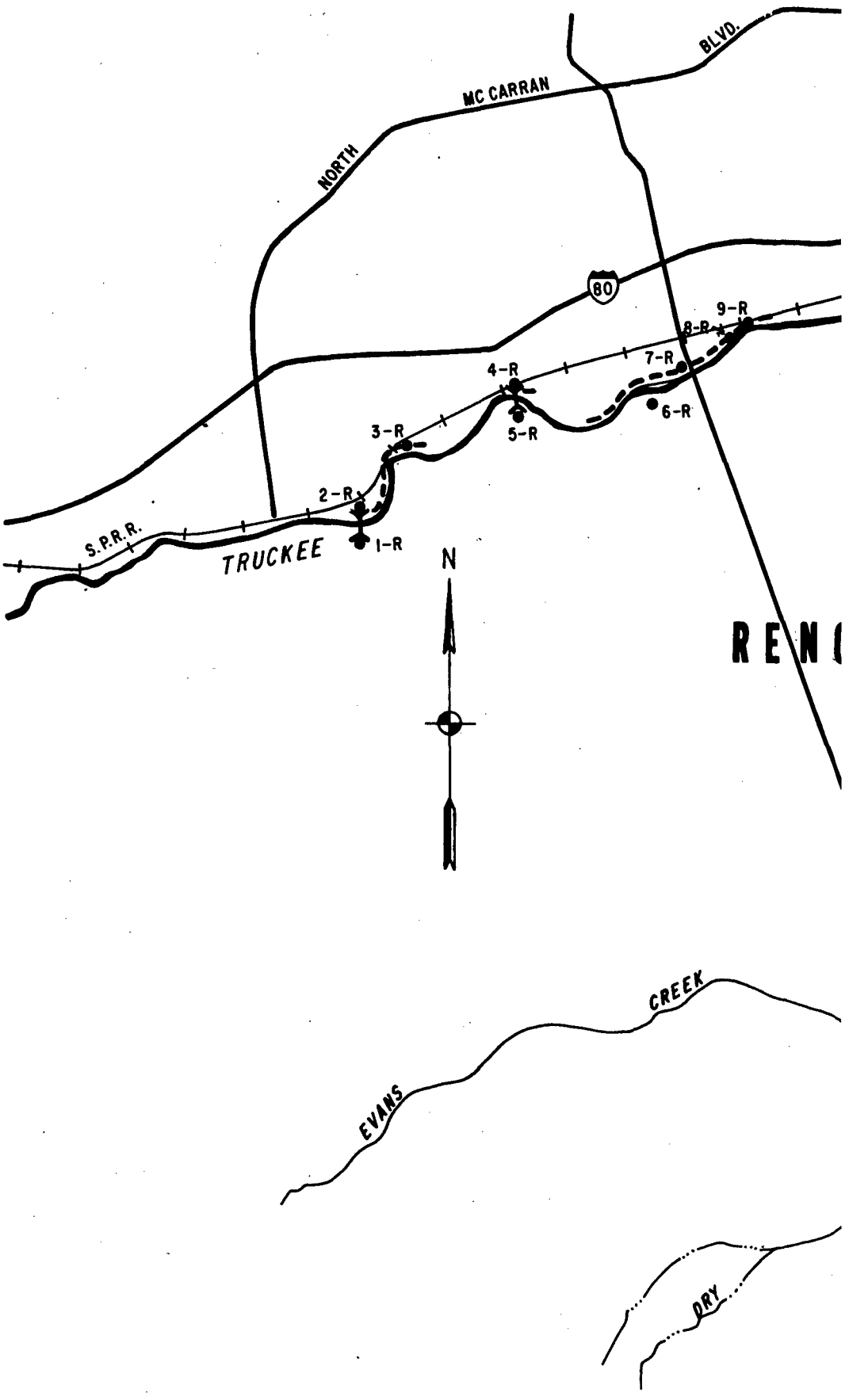
The potential for fish and wildlife enhancement in conjunction with the previous alternatives was considered and described in earlier stages of the study. During coordination with the FWS, Nevada Department of Wildlife (NDW), and other interests; significant fish and wildlife resource areas and problems were identified.

Table 24

Planned Public Recreation Access and Facilities By Others

NUMBER	NAME	MAJOR FEATURES
1-R	Crissie Caughlin Park (South Bank)	Expansion: Pedestrian/bike path, fishing/viewing decks, marsh area, picnic par-course, children's play area.
2-R	Crissie Caughlin Park (North Bank)	Parking, telephone, tubing/rafting existing facility, pedestrian/bike path.
3-R	Island Park	Environmental study area: Marsh area, interpretive exhibits, boardwalk, river viewing deck, wildlife viewing tower, observation blinds, picnic area, parking, restrooms.
4-R	Chism Park	Pedestrian/bike path, landscaping.
5-R	Idlewild Park	Expansion: Picnic facilities, tubing/rafting exit, widen portions of pedestrian/bike path.
6-R	Riverside Park	Expansion: Picnic shelter, restroom, biking concession and department storage structure, parking, sidewalk, irrigation system.
7-R	Reno Downtown Redevelopment Area (Truckee River Corridor)	Riverwalks, waterscreens, pools, fountains, laser towers, river overlooks, benches, retail stores, River Room (tourist center, shops, exhibits, garden, community room, public seating area, post office).
8-R	Unnamed access area (Urban Pocket Park)	No features described, city will have to purchase area first.
9-R	Urban Pocket Park	Small plaza design: Fountain, waterfalls, planters, steps, benches, lights.
10-R	Fisherman's Park	Picnic facilities, observation deck, restroom, pedestrian/bike path, irrigation, parking.
11-R	Unnamed access	Location map with Indian history.
12-R	Greg Street Park	City nursery, demonstration gardens displaying native vegetation, trails, passive area, rafting launch area, parking.
13-R	Unnamed urban park	Picnic and campsites, open play meadows, trails, old barn and pond preservation (restrooms), parking.
14-R	Unnamed access	Parking.
15-S	Unnamed park	Day use facilities.
16-W	Pembroke Park	Day use facilities.

*R - City of Reno.
S - City of Sparks.
W - Washoe County.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NORTH
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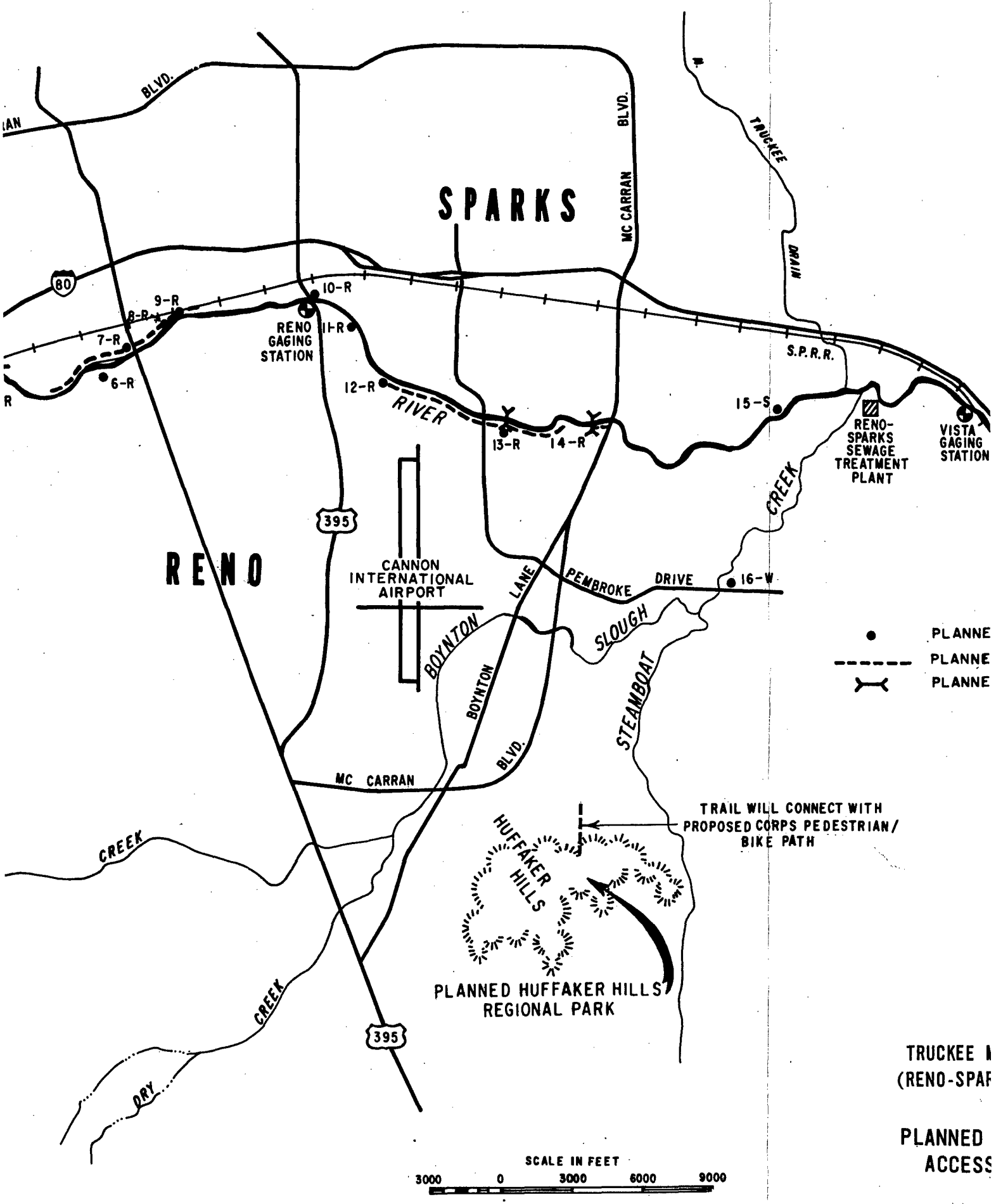

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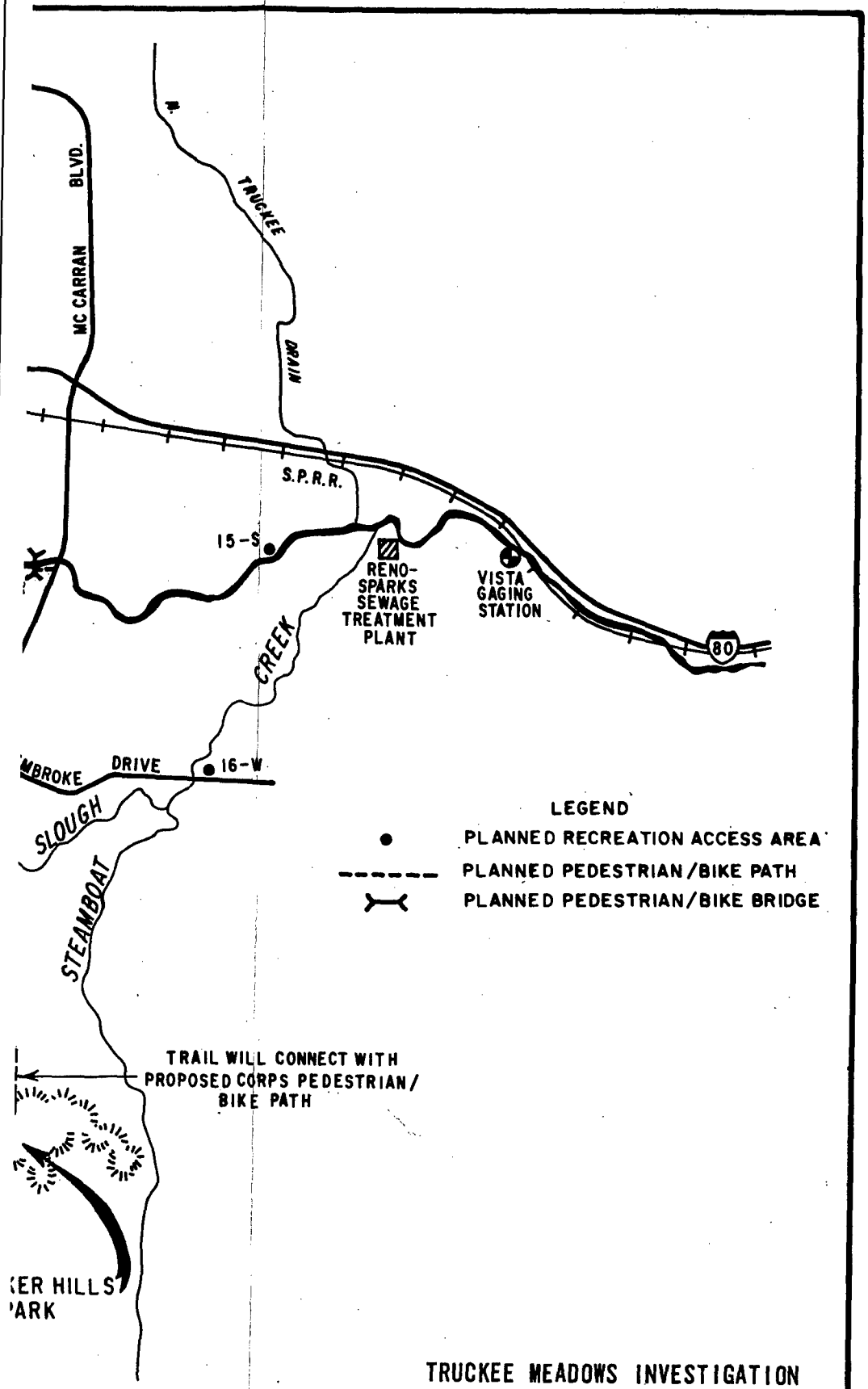


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

PLANNED PUBLIC RECREATION
ACCESS AND FACILITIES
BY OTHERS

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 21

Some possibilities for improving fish and wildlife included the following:

- o Establishment of more riparian vegetation on berms of setback levees.
- o Provisions of additional flows for fish.
- o Improvement of spawning gravels.
- o Acquisition in easement or fee of river lands and fencing to protect and improve riparian vegetation.
- o Establishment of a combination of flood overflow and wildlife preserve easement area for migratory birds and other fish and wildlife west of Steamboat Creek and at the University of Nevada Agricultural Experiment Station (UNAES) area.

Also, acquisition of remaining wetlands and seasonal marshes throughout the Truckee Meadows could preserve and improve these resources for scenic beauty, open space, and their fish and wildlife values.

In this last stage of the study the Corps and these agencies examined available methods of implementing improvements to the resources. It was determined that the selected plan did not have the potential to provide additional flows for fish or establish a wildlife preserve area in the UNAES area due to excessive costs and lack of support. The selected plan should incorporate provisions for fish habitat improvement. Both FWS and NDW expressed a desire to preserve existing riparian vegetation and marsh habitats and promote fish habitat improvement.

2. Project Potential for Fish and Wildlife.

Prior to formulation of a fish and wildlife enhancement plan, it was necessary to mitigate project impacts on fish and wildlife resources. A description of the mitigation features is provided in paragraph 3, Chapter VI. The selected plan minimizes the impacts on fish and wildlife resources by appropriate design of flood control features. That design allows for compatible resource improvements on project required lands. The floodway along Steamboat Creek precludes any obstructions that would impede the flow of floodwaters. The nature of fish and wildlife habitat enhancement in this area is not only compatible with a floodway, but also a floodway maintains the natural flooding which is important to marsh and riparian vegetation habitats. Stream bottom habitat enhancement is easily accomplished since the large rocks needed will be available during construction of the flood control features.

3. Criteria for Selecting Fish and Wildlife Features.

Construction of the flood control features will impact upon the fish and wildlife resources of the Truckee River. Prior to formulation of a fish and wildlife plan, it was necessary to determine the best method for mitigating. This was based on replacing the same habitat to the maximum extent possible. This required the selection of sites where riparian habitat could be established and protected from future developments. A plan was then formulated to enhance fish and wildlife resources beyond that expected without the project. The selection of enhancement areas was based on a sites ability to provide benefits to fish and wildlife. Consideration was also given to providing public access to these areas in a manner that would protect the resources in these areas. Review of local planning documents,

coordination with State and Federal fish and wildlife agencies, and field evaluations were utilized in the selection of the features of the fish and wildlife plan. Details of the mitigation and enhancement plans are described in Chapter VI, paragraphs 3 and 4, respectively.

4. Coordination.

Federal and non-Federal agencies were solicited for data used to develop the fish and wildlife plan. Agencies contacted were FWS's Great Basin Complex Office, cities of Reno and Sparks, and Washoe County.

5. Compatibility of Corps Fish and Wildlife Enhancement Plan with Existing and Planned Projects.

The river bottom habitat enhancement is proposed as supporting the Endangered Species Program of the FWS. The NDW manages the Truckee River fisheries by encouraging retention of riparian vegetation and stocking catchable fish. The bottom habitat enhancement would be compatible with the Department's program by diversifying the fish habitat.

The U.S. Bureau of Reclamation is authorized and has developed designs for fish screens at water diversion entrances. The proposed enhancement plans for bottom habitat are compatible with the Bureau's designs. The Bureau also releases water from Stampede Reservoir to provide additional flow for cui-ui and cutthroat trout spawning which is compatible with the Corps enhancement plans.

The riparian vegetation plantings and marsh habitat development support both the Endangered Species Act and the Migratory Bird Conservation Act.

CHAPTER VI
THE SELECTED PLAN

A. GENERAL

This section contains a description of the selected plan which was formulated and identified in the preceding section. A general description of plan components and accomplishments is included, as well as significant design, construction, and operation and maintenance aspects. The plan will provide flood protection, enhance recreation, and improve fish and wildlife resources in the study area.

B. PLAN DESCRIPTION

1. Flood Control Features.

Flood control features begin near Booth Street Bridge and proceed downstream to the Reno-Sparks Wastewater treatment facility; then continue up Steamboat Creek through the University of Nevada Agricultural Experiment Station (UNAES) south of the Truckee River for approximately 2 miles. The flood control features are displayed on Figure 22 and Plates 5 through 9. Selected cross sections and profile plots are shown on Plates 10 through 18. A detailed description of the project features follows:

a. Floodwalls and setback floodwalls would be constructed or reconstructed along the north bank of Truckee River between Lake Street and Booth Street, and on the south bank between Lake Street and 1400 feet upstream of Arlington Avenue. Floodwalls and setback floodwalls would average 2 to 4 feet in height.

b. Bridges would be reconstructed and/or replaced at or above grade at Arlington Avenue, Booth, Virginia, Lake, Sierra and Center Streets. The footbridges at Wingfield Park would also be elevated.

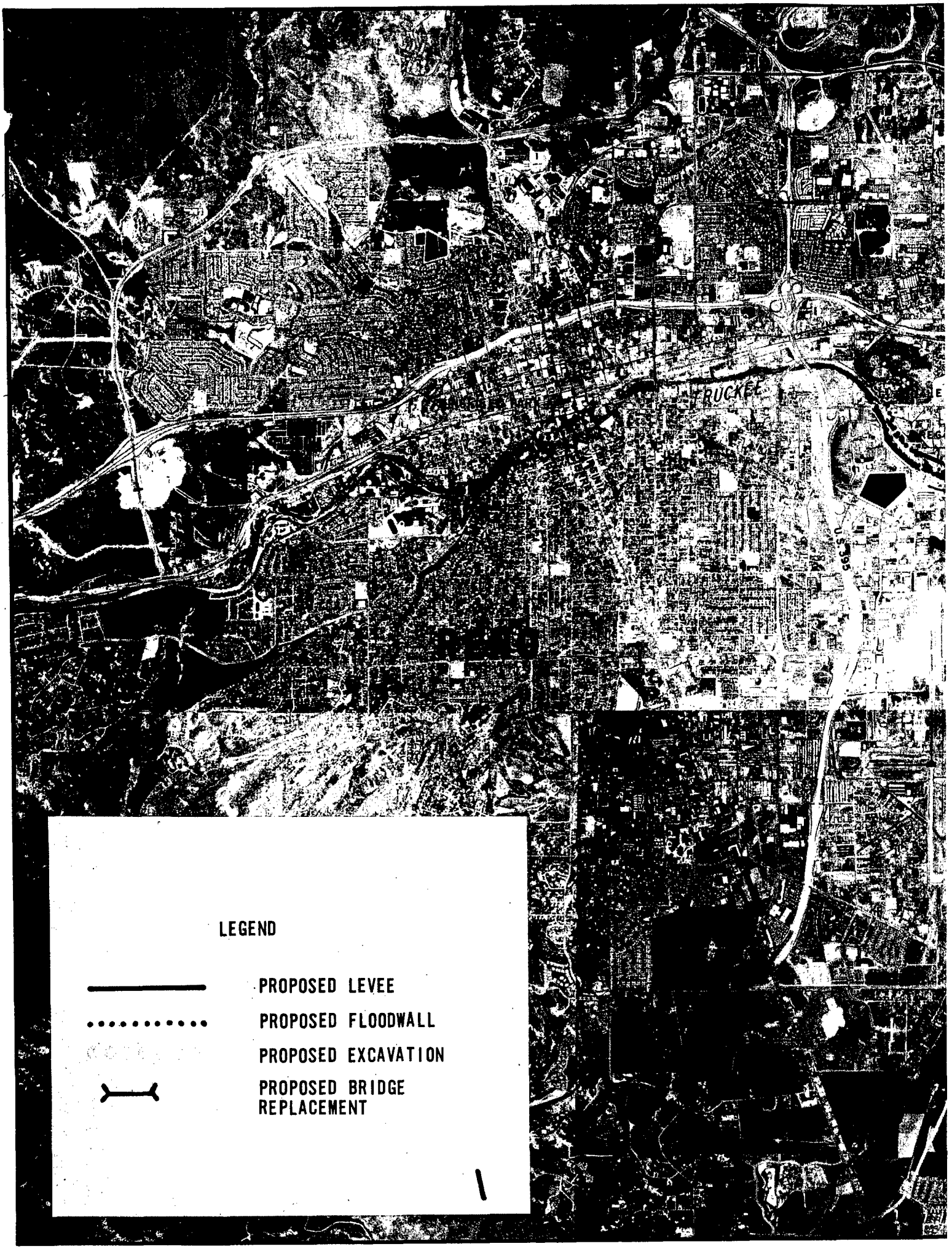
c. Channel excavation is proposed along the north bank of Truckee River in the vicinity of Booth Street bridge, and excavation would also take place through the stream channel to a maximum depth of 1.5 feet from just above Arlington Avenue bridge to just above Sierra Street bridge. The total river distance involved is approximately 1,600 feet.

d. From US Highway 395 to Glendale Avenue setback floodwalls are planned for the south bank only (4 to 7 feet in height).

e. The North Truckee Ditch diversion dam just above Glendale Avenue would be reconstructed and realigned.

f. Between Glendale Avenue and South Rock Boulevard there would be setback floodwalls and setback levees (5 to 8 feet in height).

g. Between South Rock Boulevard and South McCarran Boulevard there would be setback floodwalls, floodwalls at the river's edge, and setback levees (5 to 8 feet in height).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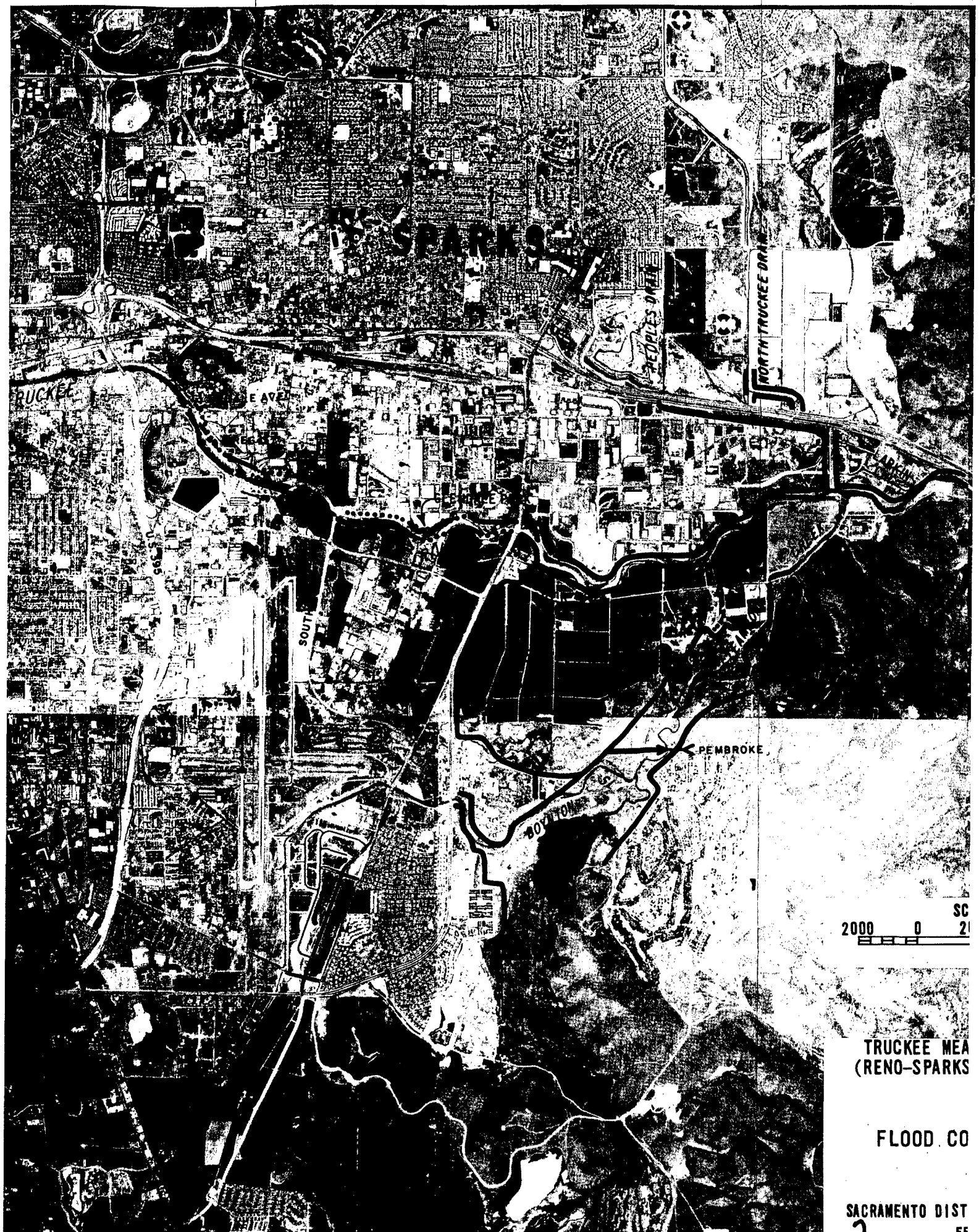
LEGEND
PROPOSED LEVEE
PROPOSED FLOODWALL
PROPOSED EXCAVATION
PROPOSED BRIDGE REPLACEMENT



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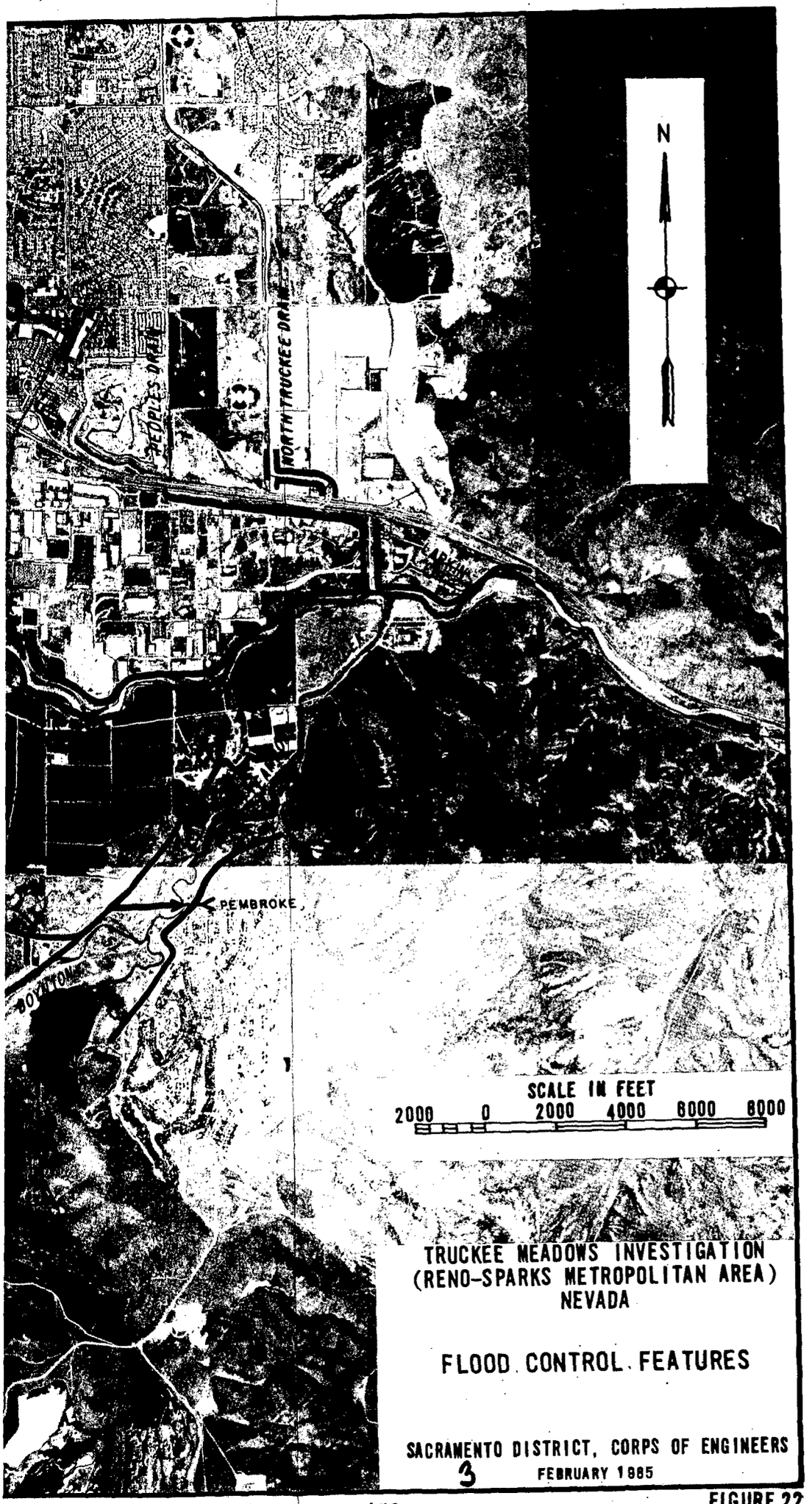


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

FLOOD CONTROL FEATURES

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
3 FEBRUARY 1985

FIGURE 22

h. In the area of Glendale Park, 5.6 acres along the north bank would be excavated above the water surface elevation of the Truckee River associated with 1,000 cfs discharge (estimated average annual flow).

i. Between South McCarran Boulevard and the east end of the project at Vista, setback levees would be built on both sides of the river. These levees would be about 11 feet high and 82 to 90 feet wide at the base.

j. Backwater levees with an average height of 5 feet would be built on North Truckee Drain from the confluence with the Truckee River to approximately 900 feet north of freeway I-80. This levee also extends along the Southern Pacific Railroad alignment to Peoples Drain.

k. Immediately east of the UNAES on South McCarran Boulevard, a 1,000-foot overflow weir would be built and approximately 7 acres excavated from the south bank of the Truckee River and adjacent agricultural land.

l. The UNAES would be surrounded by 10-foot levees and serve as an overflow area to temporarily store peak flows of floods greater than a 35-year event. This is intended to preclude increased flood peaks for areas downstream of the project. An overflow weir and low level outlet structure would be located along the east side levee to release flows back into the Truckee River.

m. Levees with an average height of 10.5 feet would be constructed along Steamboat Creek and Boynton Slough. Pembroke Drive bridge over Steamboat Creek will be raised and lengthened to provide for more flow under the bridge.

n. The project features have been designed to allow for controlled overtopping when the design capacity has been exceeded. The controlled overtopping will prevent levee failure and route the excess floodwaters to the same areas they would go to without the project.

o. Interior flood control features are included to evacuate and/or accomodate any excess ponding behind protective works.

2. Recreation Features.

a. General. - The recreation plan will provide access to the flood control features on project lands and link those features with the existing and planned path system. The plan will complement other recreation plans for the area, in particular, the existing City of Sparks Truckee River Greenbelt and the City of Reno's access sites and paths.

b. Construction Disturbance. - The Corps has coordinated with the National Park Service (NPS), Nevada Division of State Parks and local agencies to develop a flood control plan that would be compatible with the existing park and open space features. The selected plan has, to the extent possible, avoided construction of flood control features within park areas.

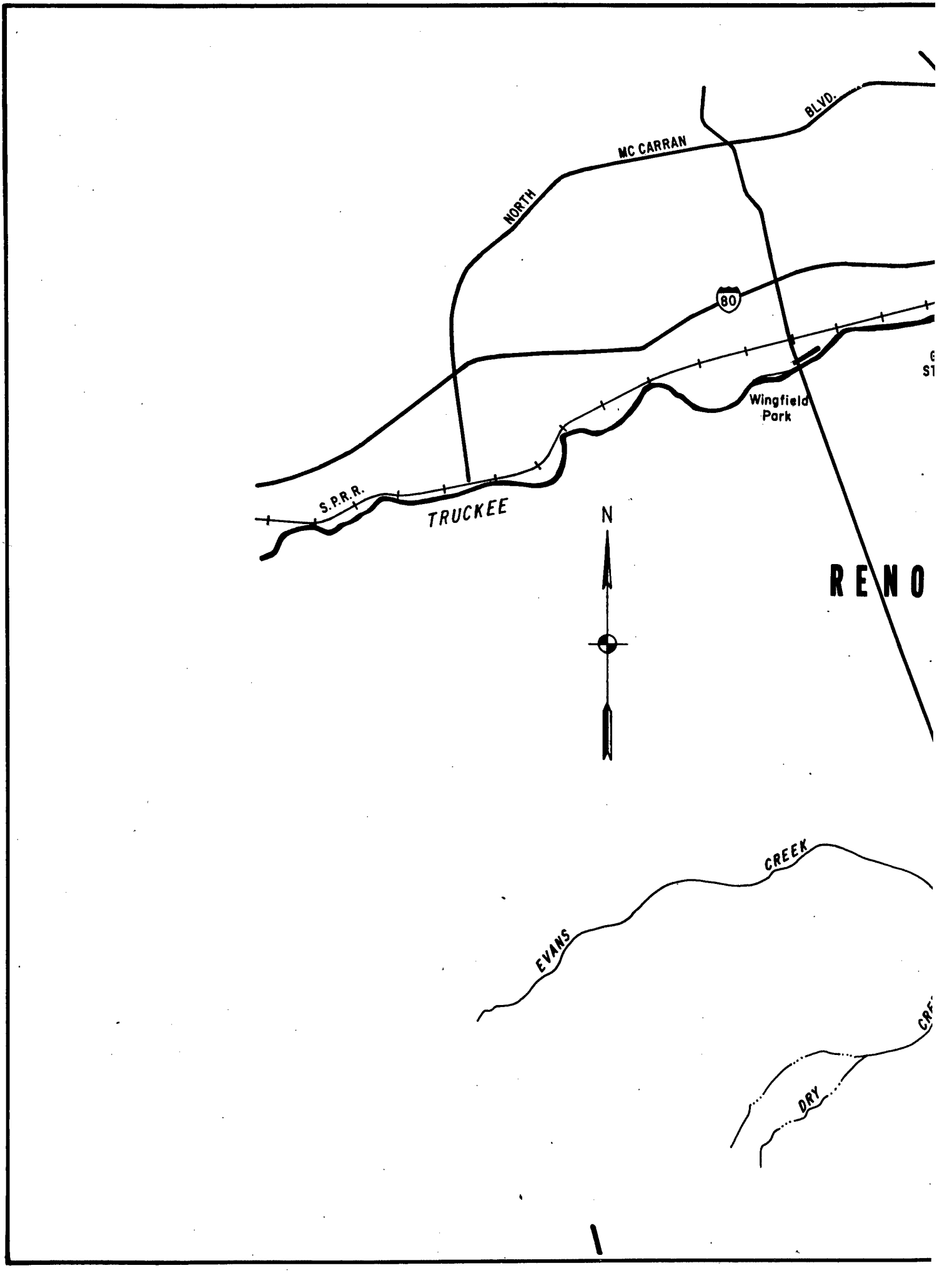
However, there are several locations where construction within or adjacent to the existing parks would disturb usage of these park facilities. Temporary disturbance that would interrupt usage of park facilities during the construction period would occur at the following locations (see Figure 23):

Location	Impact
Wingfield Park	Pedestrian bridges will be raised. 400 feet of pedestrian/bicycle path would be rebuilt in place.
Sparks Greenbelt west of Greg Street Bridge	400 feet of pedestrian/bicycle path would be relocated on top of the new levee.
Glendale Park	1. 5.6 acres of land would be excavated to an elevation still above the average summer flow. This will remove material from a presently barren mound along the river. The excavation would be a beneficial impact according to the National Park Service because of a better view of the river and increased access to the shoreline. 2. 800 feet of pedestrian/bicycle path would be relocated approximately 50-100 feet north of its existing location (still within Glendale Park).
Sparks Greenbelt downstream of North Truckee Drain	500 feet of pedestrian/bicycle path would be relocated on top of the new levee.

Approximately one acre of park and open space lands along the Sparks greenbelt would be permanently converted to levee and floodway features. The 1 acre would be spread over several locations from Glendale Park to the downstream end of the levee near Larkin Circle. This proposal development has been coordinated with the City of Sparks and NPS and this has resulted in the planned 1 acre Franklin Park being proposed as an equivalent replacement for the park lands converted to flood control facilities.

During coordination with NPS, recreation lands and facilities that were purchased with Land and Water Conservation Fund Act (LWCFA) funds were identified. None of the City of Reno recreation lands or facilities that would be disturbed were purchased with LWCFA funds. The City of Sparks used LWCFA funds for land acquisition and facility construction for portions of the Truckee River Greenbelt. LWCFA lands that would be affected by project construction include about 1 acre of park and open space lands spread along the Sparks greenbelt. Coordination with the City of Sparks, State Parks and NPS will continue during detailed design studies on the conversion of LWCFA lands.

c. Recreation Plan Description. - The plan is composed of a mix of multi-purpose day use facilities: bike and pedestrian paths, river overlooks/observation decks, public seating areas, picnic sites, interpretive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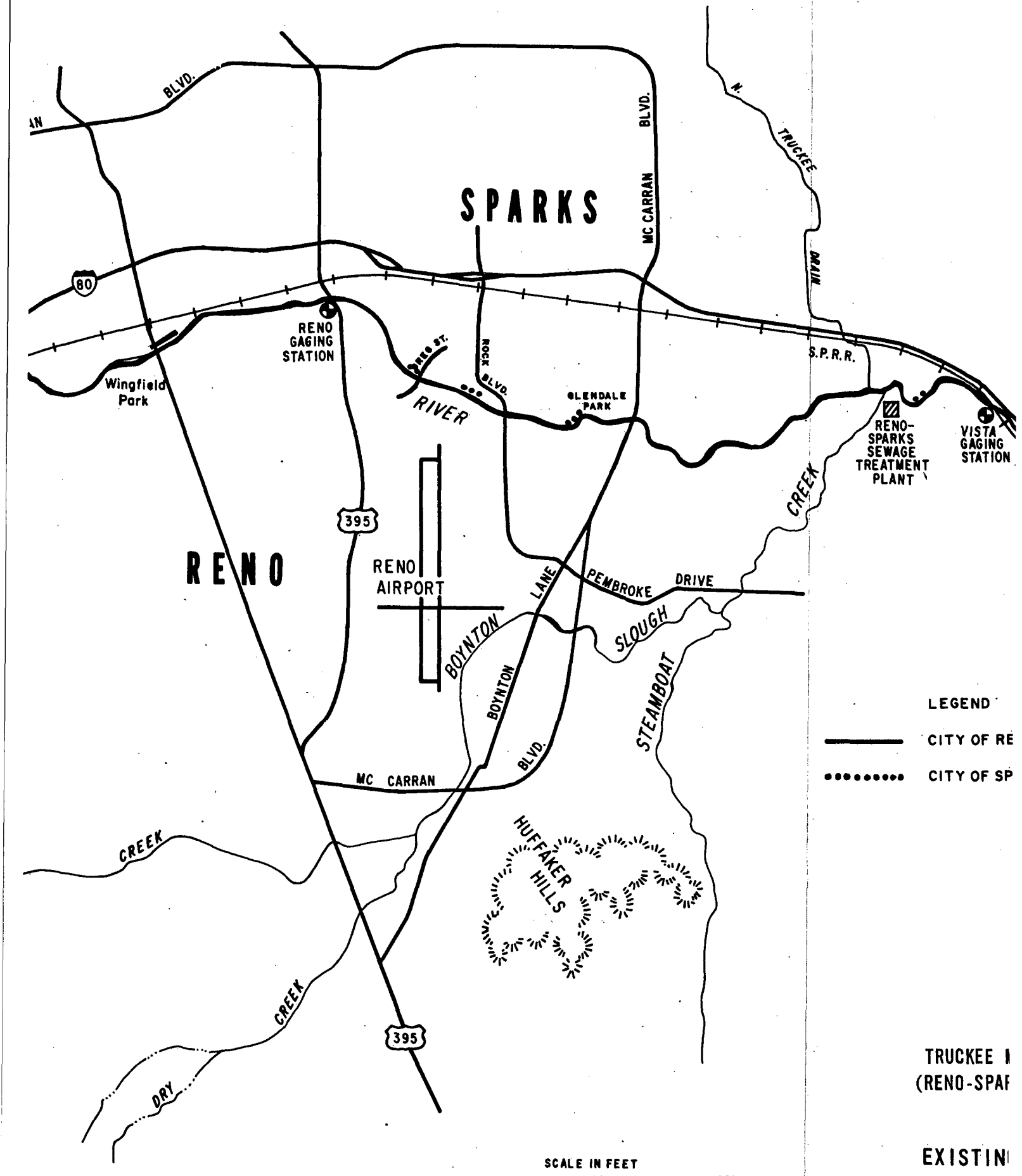

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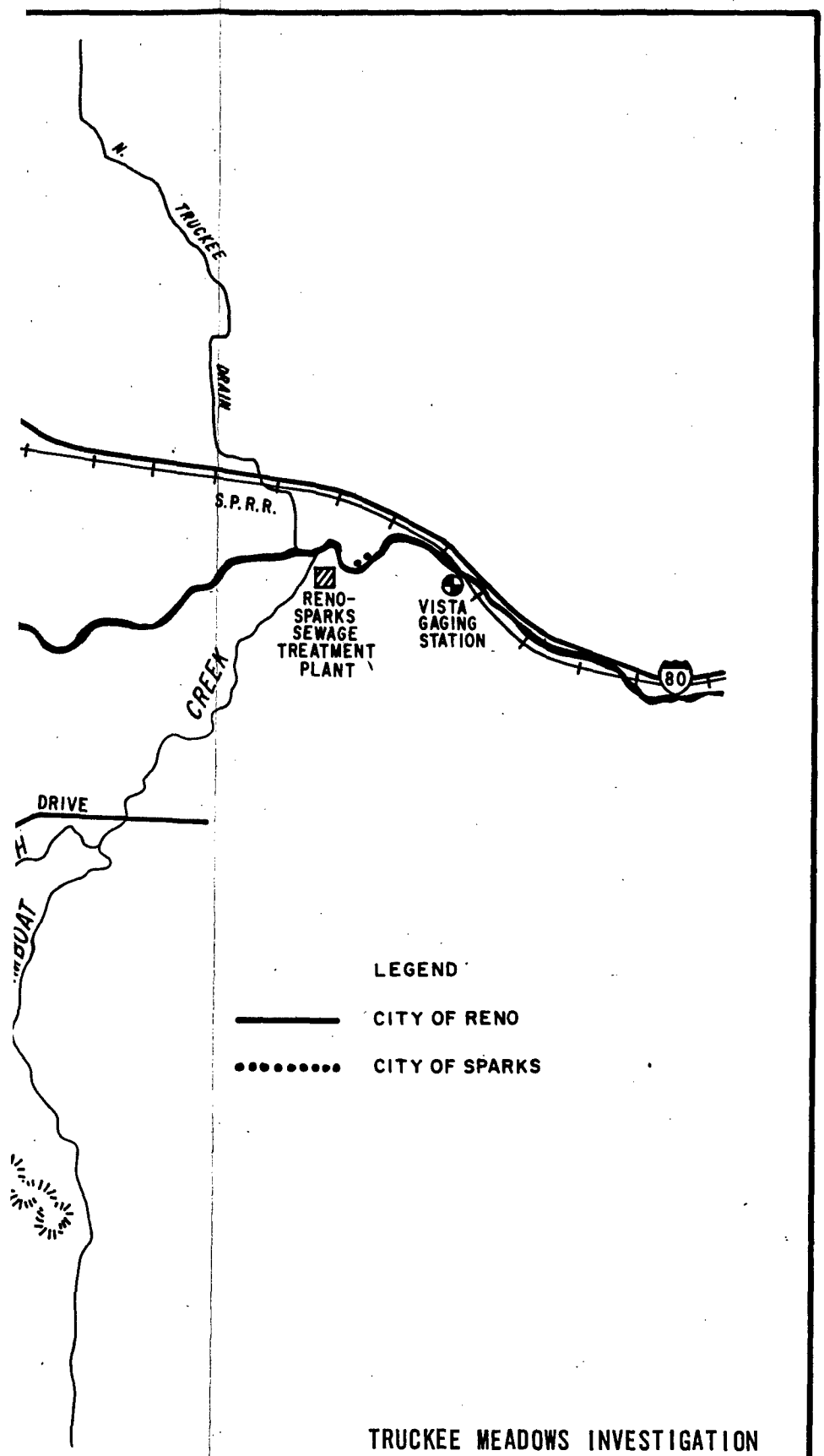


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

EXISTING RECREATION AREAS
DISTURBED BY CONSTRUCTION

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 23

signs/exhibits, and a marsh nature area. The plan includes seven new access sites and improvements to existing Riverside Park and to the Riverwalk area in downtown Reno. Of the approximately 22.7 miles of existing and proposed pedestrian/bike paths, 14.4 miles will be new paths (including 1,600 feet along an existing road) and 300 feet of widened existing path. Of the proposed new paths and path on an existing road, 4.6 miles will be on the Truckee River and 9.8 miles will be along the detention basin, Steamboat Creek, and Steamboat Marsh. In certain instances, the pedestrian/bike paths can be incorporated into service roads along many portions of the Truckee River and Steamboat Creek. These paths link existing and proposed recreation access sites and provide access to flood control areas. The recreation access sites provide facilities and opportunities for fishing, swimming, rafting/tubing, and picnicking. Proposed recreation access and facilities are listed in Table 25 and shown on Figure 24. Also, on Plate 19 these features are displayed with existing facilities and those planned recreation facilities proposed by the local agencies.

A new pedestrian/bike bridge will be built, and bike lanes will be provided on the following new bridges: Booth Street, Lake Street, and Pembroke Drive bridges, and on the bridge across Boynton Slough on South McCarran Boulevard. Ten sets of steps leading to the river, four observation decks, ten locator or interpretive signs, and six rafting/tubing launch/exits will be dispersed along the Truckee River. Specifically, the major rafting/tubing accesses will be provided at these areas: Riverside Park (exit structure), Greg Street Park (launch/exit structure), Mill Street Park (no structure required-launch/exit access by riverbank), Riverbend Access (launch/exit structure), and Basin River Access (exit structure).

3. Mitigation Features.

Mitigation planning for potential fish and wildlife habitat impacts began during the design of the selected plan by locating flood control facilities to avoid fish and wildlife habitat. For unavoidable impacts, management plans have been developed to compensate for the lost habitat or resource impacts.

a. Avoidance and Mitigation. - Mitigation initially involves avoiding and minimizing potential detrimental impacts. The selected plan was designed to avoid riparian vegetation where possible by incorporating floodwalls. To minimize removal of riparian vegetation, levees would be set back from the vegetated river's edge where possible. Impacts to fish habitat will be minimized by carrying out channel excavation between spawning seasons. To reduce turbidity associated with construction, sediment buildup behind the North Truckee Ditch diversion dam will be removed by hydraulic dredging prior to realignment. Use of silt curtains, flow diversions, and timing of construction during low flows will also reduce turbidity. Further reduction in potential detrimental impacts to fish habitat was achieved in the selected plan by designing for much of the excavation above the 1,000 cfs flow elevation which is above the riverbed habitat.

b. Compensation. - To compensate for riparian and wetland habitat loss, native riparian trees will be planted mostly in areas where riparian habitat does not now exist, beginning in the first year of construction (Figure 25). The planting would fill in gaps and generally make a wider bank

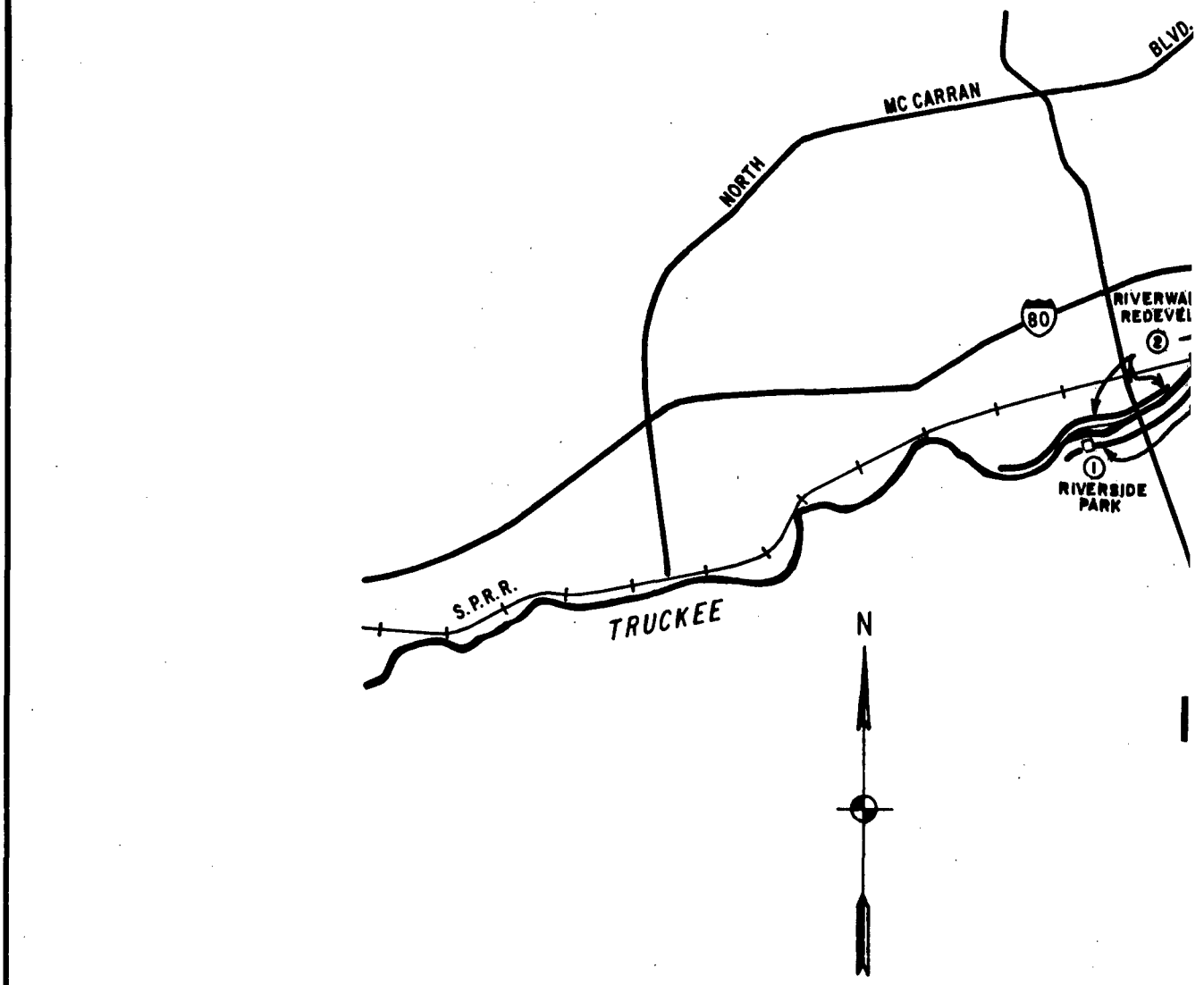
Table 25
CORPS PROPOSED RECREATION ACCESS AND FACILITIES

SITE NO.	NAME	POTENTIAL OPERATING AGENCY	ACCESS	ACTIVITIES	FACILITIES
1	Riverside Park	Department of Parks and Recreation, City of Reno	Island Ave., Arlington Ave., Elosie Ave.	Bicycling, walking, jogging, tubing/rafting exit	7 parking spaces-auto, 1 restroom, walkway
2	Riverwalk-Downtown Reno Redevelopment Area	Department of parks and Recreation, City of Reno	Island Ave., Arlington Ave., Sierra St., S. Virginia St., N. Center St., S. Center St., Lake St., Truckee River Lane, 1st St., Riverside Drive	Picnicking, bicycling, walking, jogging	10 picnic sites, 4 river overlooks, 1 public seating area, 5 acres landscaping, esthetic treatment to enhance riverfront theme, lighting, potable water
3	Greg St. Park	Department of Parks and Recreation, City of Reno	Greg St.	Picnicking, tubing/rafting, swimming, fishing	Paths, 50 parking spaces-auto, 1 restroom, 2 acres landscaping, potable water
4	Mill St. Park	Department of Parks and Recreation, City of Reno	Mill St.	Picnicking, bicycling, walking, jogging, swimming, fishing, rafting/tubing-put in/take out	15 picnic sites, 1 group picnic shelter, 55 parking spaces-auto, 1 restroom, 1 acre landscaping, potable water, pedestrian/bike bridge
5	Riverbend Access	Department of Parks and Recreation, City of Reno	Mill St.	River access	25 parking spaces-auto, 1 restroom
6	Kimlick Park	Washoe County Parks and Recreation Department	Kimlick Lane	Picnicking, fishing, swimming, rafting/tubing	20 picnic sites, 1 group picnic shelter, 50 parking spaces-auto, 1 restroom, 5 acres landscaping, potable water
7	Basin River Access (Alternative: McCarran River Access)	Washoe County Parks and Recreation Department	Kimlick Lane	Picnicking, rafting/tubing exit, fishing	50 parking spaces-auto, 20 picnic sites, 1 group picnic shelter, 1 restroom
8	Franklin Park[1/]	Recreation Department, City of Sparks	Franklin Way	Picnicking	5 picnic sites, 25 parking spaces-auto, 1 restroom, 3/4 acre landscaping, potable water

TABLE 25
CORPS PROPOSED RECREATION ACCESS AND FACILITIES - (Continued)

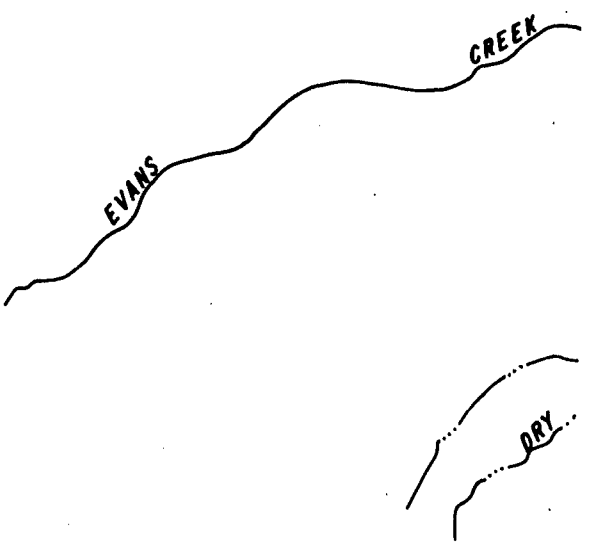
SITE NO.	NAME	POTENTIAL OPERATING AGENCY	ACCESS	ACTIVITIES	FACILITIES
9	Pembroke Park	Washoe County Parks and Recreation Department	Pembroke Drive	Picnicking, playfield activities, playground activities, parcourse activities	10 picnic sites, 50 parking spaces-auto, 1 restroom, 5 acres landscaping, potable water
	Pedestrian/Bike	Recreation Department City of Reno or Washoe County Parks and Recreation Department	Varies	Bicycling, hiking, jogging, and other fitness activities	14.4 total miles of path (4.55 miles of path on Truckee River and 9.83 miles of path in Truckee Meadows (off Truckee River))

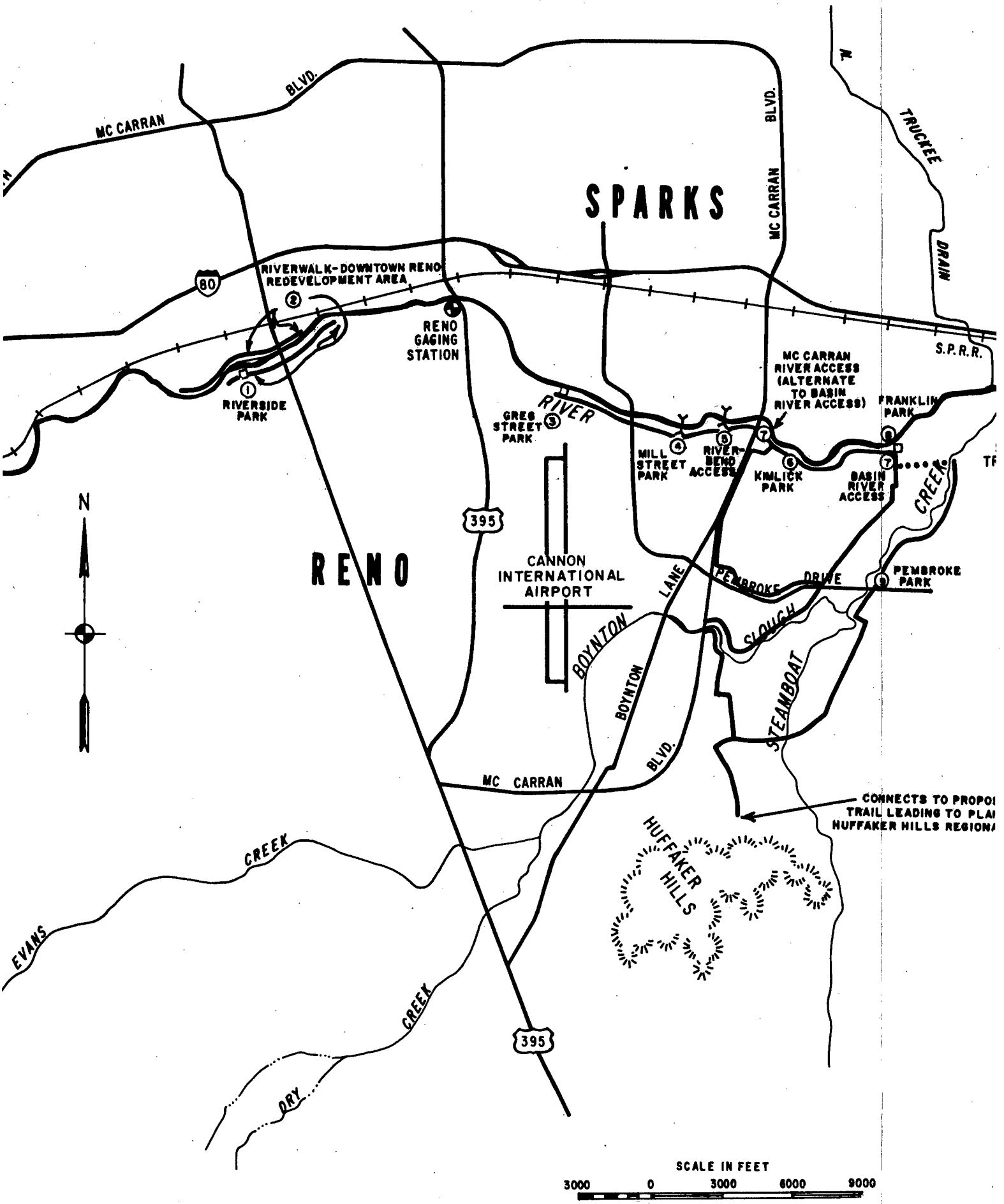
1/ Franklin Park is identified for development in the recreation plan. Costs for the acquisition will not be included in the recreation costs since this area is proposed as a replacement for the converted LWCFA lands and thus is considered a relocation cost allocated to the flood control cost.



LEGEND

- WIDEN EXISTING PEDESTRIAN/ BIKE PATH
- NEW PEDESTRIAN/BIKE PATH
- PEDESTRIAN/BIKE BRIDGE
- BIKE ROUTE ON EXISTING ROAD
- ① ⊢ ⑨ RIVER ACCESS/PARK (SEE TABLE 25)
- TUBING/RAFTING/LAUNCH AND/OR EXIT

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RENO GAGING STATION
S.P.R.R.
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FRANKLIN PARK
RIVERSIDE PARK
GRES STREET PARK
RIVER
MILL STREET PARK
RIVER-BEND ACCESS
KIMLICK PARK
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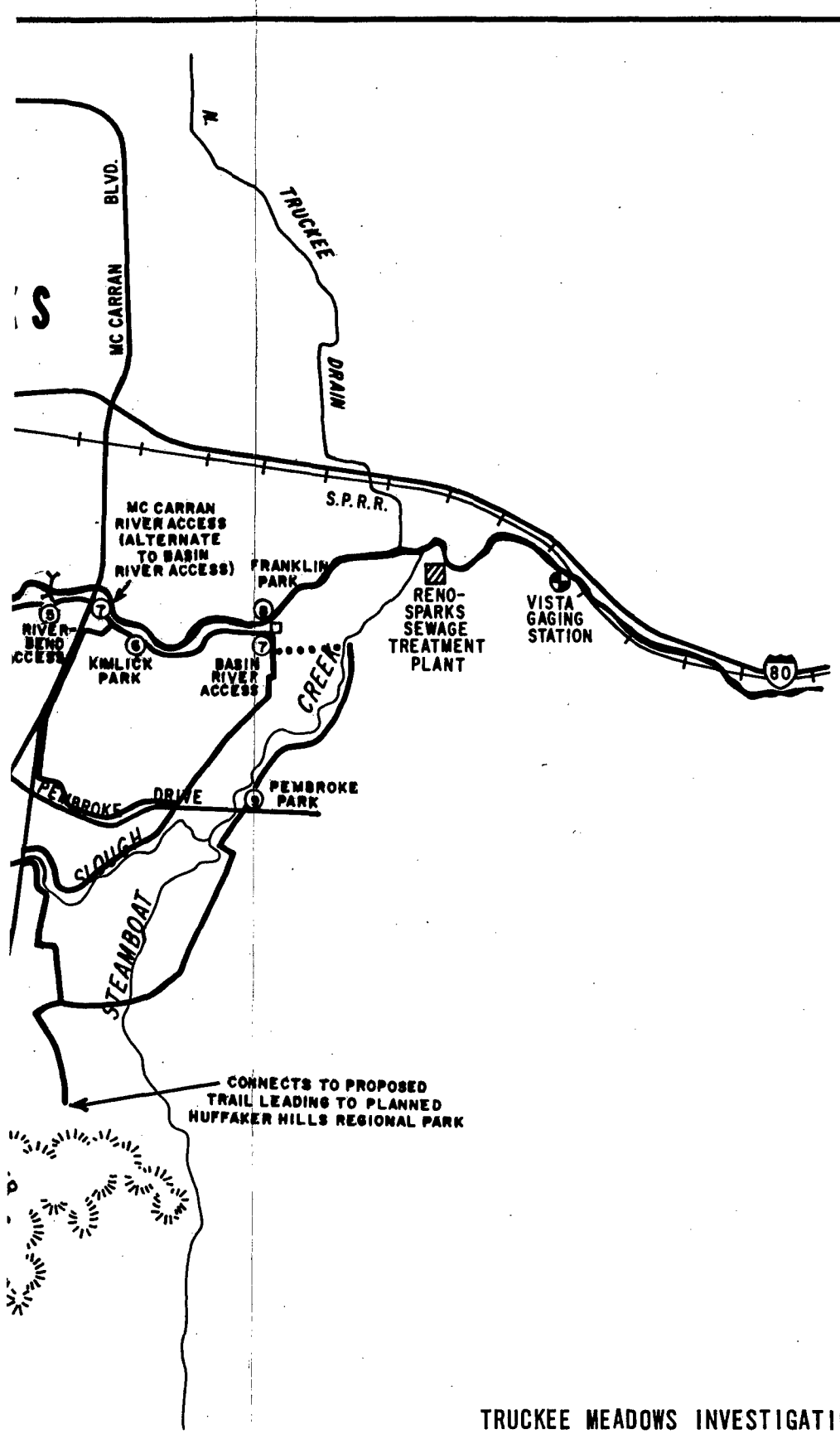

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

CORPS PROPOSED RECREATION
ACCESS AND FACILITIES

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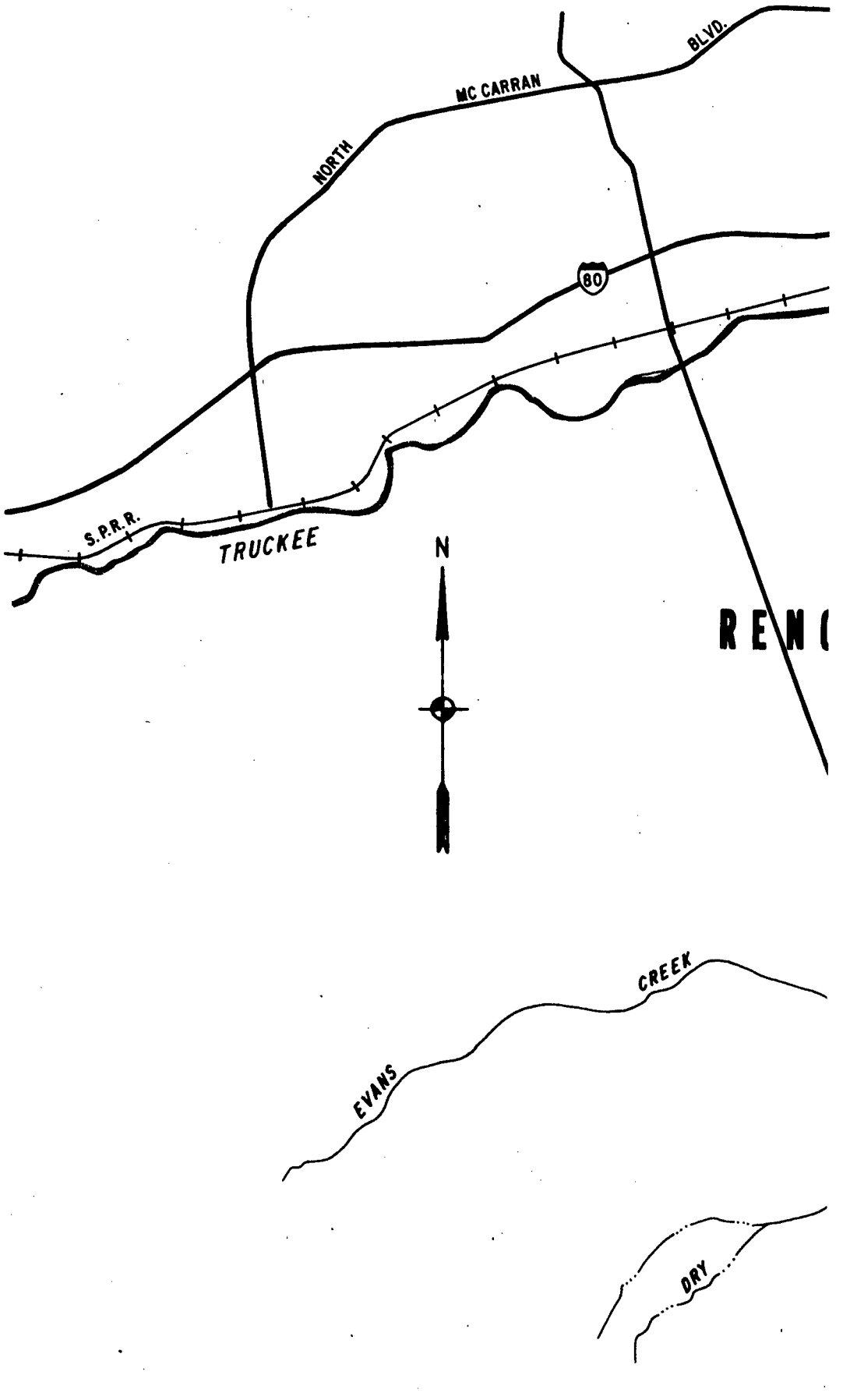
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985
REVISED JULY 1985

FIGURE 24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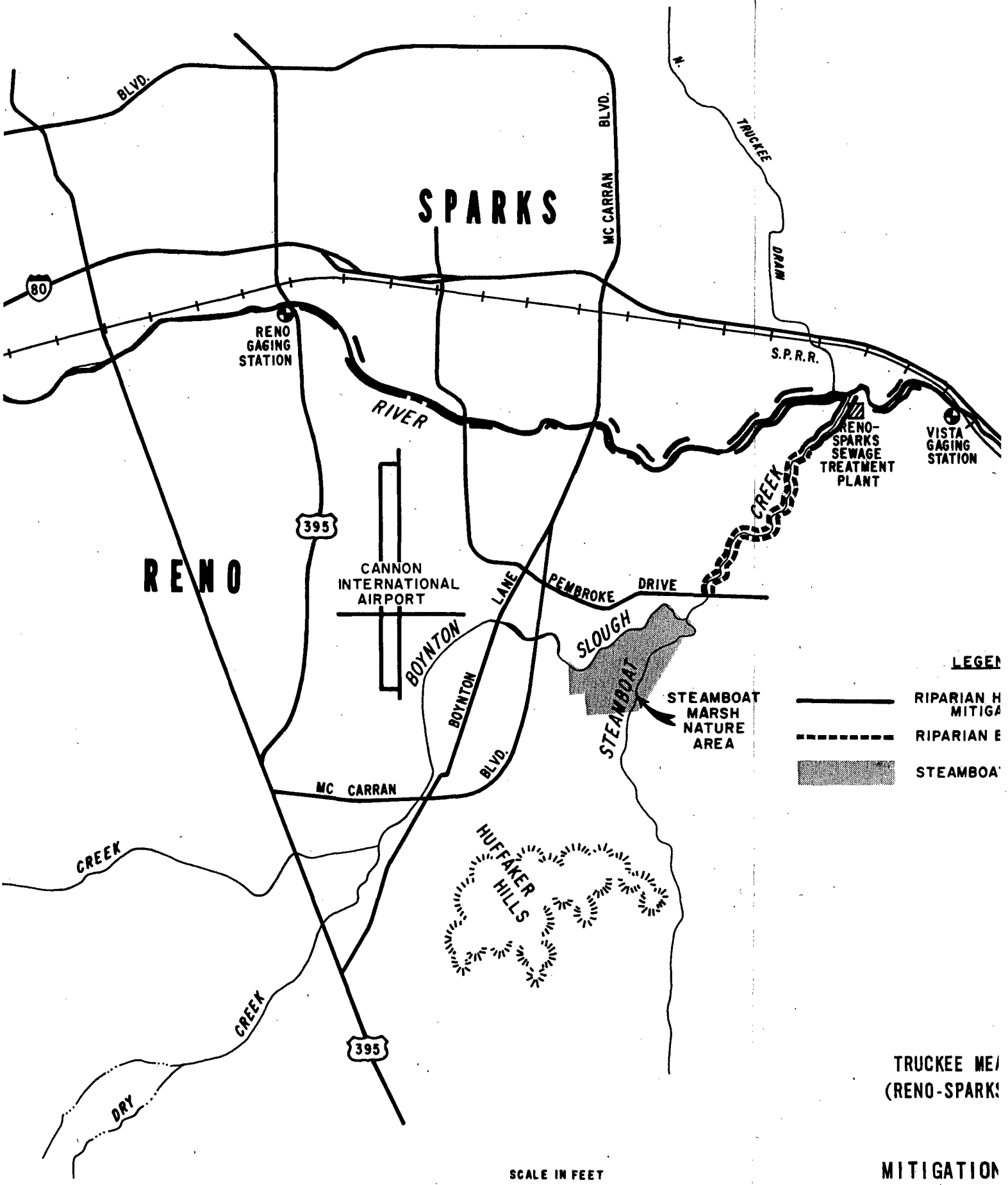

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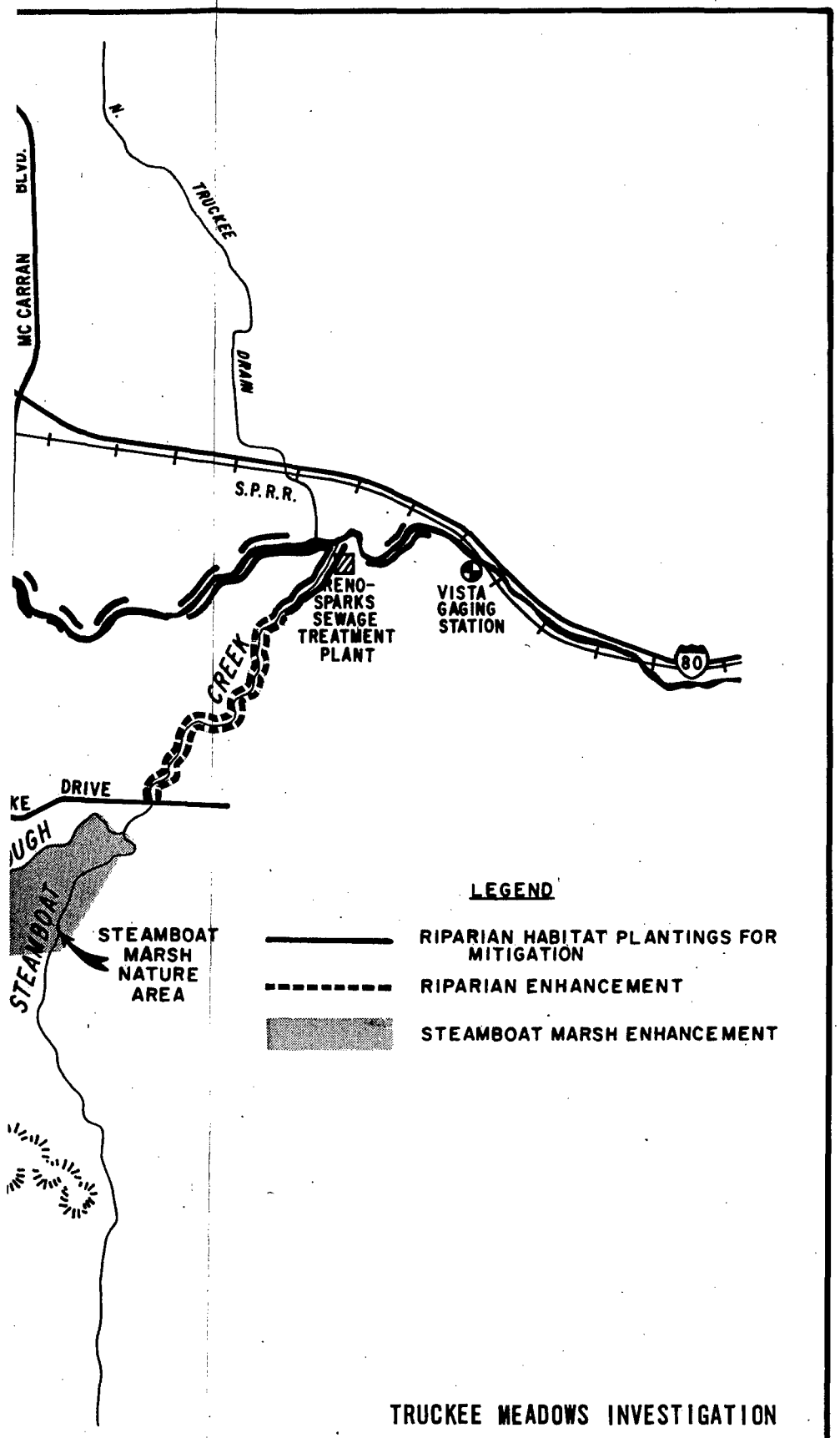


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

MITIGATION AND ENHANCEMENT

3 SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 25

of vegetation between the setback levees and floodwalls and the river. In the reach from the mouth of Steamboat Creek to a point about 2 miles upstream on the right bank, the Truckee River bank will be sloped and planted with native trees. These plantings will be on a replacement basis only. Plantings will also be made on both banks of Steamboat Creek upstream (south) for about 5,000 feet to complete the mitigation. This mitigation feature is justified based on preventing the loss of monetary and intangible values. Riparian plantings, at a cost of $345,000 ($29,400 annual cost), would prevent further degradation of cui-ui and cutthroat habitat due to temperature increases and the loss of 52,000 nonconsumptive use days valued at $234,000 (Fish and Wildlife Coordination Act Report). A total of about 31 acres of riparian plantings would be provided. Table 26 summarizes the acres lost and mitigation proposed.

The riparian habitat planting will mitigate for losses to the wildlife which require this habitat for their life requisites. Mitigation will benefit the small mammals such as the longtail vole which inhabits streambanks and feeds on grasses and twig bark. The various species of bats in the study area feed on flying and ground insects that live in riparian vegetation. Many species of birds such as the belted kingfisher, Say's phoebe, barn swallow, and yellow warbler will receive habitat mitigation. These birds need riparian habitat for feeding and nesting. Riparian habitat mitigation will also benefit the fishery of the Truckee River by providing shade to reduce warming of the water and providing insects for food.

Plantings beginning during the first year of construction will minimize the time for potential detrimental temperature rises.

Turbidity levels downstream of construction sites will meet the Nevada State Water Quality Standards ("not more than 12.0 NTU") during work in the river.

The excavation immediately downstream of Wingfield Diversion will cause an impediment to upstream movement for fish and will be mitigated with fish ladders over the diversion. A ladder may be required on each side of Wingfield Park. The ladders, at a cost of $45,000 ($3,800 annual cost), are justified based on preventing the loss of native and planted fish and the threatened Lahontan cutthroat trout and the loss of 3,000 angler-use days valued at $11,000 (Fish and Wildlife Coordination Act Report). FWS has proposed an alternative of removal of the diversion. This alternative will be evaluated during detailed studies, however, it has been determined that this alternative would not change the formulation and benefit-cost estimate for the proposed plan.

All 31.4 acres of mitigation land are located on lands required for flood control improvements. 16.4 acres are located on flood control lands acquired in fee. The remaining 15 acres are located on lands where only flowage easements are required. These lands at a cost of $140,000 ($11,900 annual cost), are needed for the riparian habitat plantings. Additional rights will be required on these lands for the mitigation purpose and the associated costs are included in the flood control cost. The 15 acres are located along Steamboat Creek just south of the Truckee River (6 acres) and along the south bank of Truckee River near the confluence of Steamboat Creek (9 acres).

TABLE 26

SUMMARY OF IMPACTS AND MITIGATION
FOR RIPARIAN AND WETLAND HABITAT

Project Losses			
Loss on Truckee River	22.9	acres	
Loss on North Truckee Drain	0.3	acres	
Loss on Boynton Slough	2.6	acres	
Total Loss	25.8	acres	
Annual Loss	25.1	acres	1/
Mitigation Goal	31.4	acres	2/
Planned Mitigation			
Mitigation on Truckee River	25.3	acres	
Mitigation on Steamboat Creek	5.8	acres	
Mitigation on North Truckee Drain	0.3	acre	
Total Mitigation	31.4	acres	

1/ Annual loss takes into account the value to wildlife over the project life. This includes 25% of retained value during the 6 year construction period and the loss over the 50-year period of analysis. The loss is calculated as follows:

$$\frac{(25.8 \text{ acres} \times 75\% \text{ value} \times 6 \text{ years}) + (25.8 \text{ acres} \times 100\% \text{ value} \times 50 \text{ years})}{56 \text{ years}} = 25.1 \text{ acres}$$

2/ Mitigation goal includes an adjustment for establishment time (adjustment period 1-20 years = 50% value3/, adjustment years 20-50 years = 100% value).

Average value with adjustment =

$$\frac{(50\% \times 20 \text{ years}) + (100\% \times 30 \text{ years})}{50 \text{ years}} = .80$$

Mitigation goal = Annualized loss/.80 = 25.1/.80 = 31.4 acres

3/ The FWS Coordination Act Report shows an average loss value of 37.5% for the establishment period. This was revised in this analysis to a 50% value during the establishment period over the first 20 years. The 50% value is estimated to be most realistic considering the species and proposed planting scheme.

4. Fish and Wildlife Enhancement Features.

The potential enhancement features have been developed by the Corps and FWS from review of agency plans, discussions with agency staffs, and public workshops. The enhancement measures identified within the project study area include additional riparian habitat planting, marsh habitat preservation, and fish habitat improvement, and were developed to maximize fish and wildlife resources on lands required for flood control.

The proposed enhancement features support implementation of the purposes and policies of the Migratory Bird Conservation Act and the Endangered Species Act as stated in the FWS Coordination Act Report and their letter dated 20 December 1984. The Migratory Bird Conservation Act states that the United States of America is obligated under the migratory bird treaties with other countries to lessen ". . . the dangers threatening migratory birds from drainage and other causes, by the acquisition of areas of land and of water to furnish in perpetuity reservations for the adequate protection of such birds; and authorizing appropriations for the establishment of such areas, their maintenance and improvement, and for other purposes . . .".

The purposes of the Endangered Species Act are ". . . to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved . . .". It is "the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act".

The plan would include 9.5 acres of riparian plantings on Steamboat Creek above the riparian mitigation requirements which would provide more migratory bird habitat than now exists or is expected to develop without a project. The planting would extend from Pembroke Drive downstream to meet with the mitigation plantings. The linear extent would be about 8,000 feet along both sides of the creek and consist of planting cottonwood trees at 25 feet on center. The high water temperature of the Truckee River is a significant impediment to reestablishment of the threatened Lahontan cutthroat trout in the study area reach of the river. The proposed riparian vegetation enhancement, combined with the mitigation, would contribute to cutthroat trout reestablishment by lowering Steamboat Creek's temperature by shading the water before it merges with the Truckee River. This shading would lower water temperature in Steamboat Creek and the Truckee River below Steamboat Creek by as much as 2.35°F and 0.35°F, respectively, under summer low flow conditions. This would keep an additional one-third of a mile of Truckee River below Steamboat Creek inhabitable by cutthroat trout. During the spring spawning of the endangered cui-ui and the cutthroat trout, water temperature is a limiting factor to successful spawning. In the lower Truckee River below Derby Dam where spawning occurs today, any reduction in water temperature would be beneficial. The lower temperatures produced by Steamboat Creek water entering the Truckee River will continue to have a beneficial effect downstream of Derby Dam under some of the critical temperatures for spawning. At these critical conditions the enhancement on Steamboat Creek would allow for more successful spawning than under the same conditions without the enhancement. This enhancement thus supports the recovery efforts for both fish under the Endangered Species Act.

The 9.5 acres of riparian plantings would also benefit migratory birds dependent on riparian vegetation. The land for this enhancement will be required for the flood control purpose. The fee title to these lands will be required to retain the vegetation for the enhancement feature.

The Steamboat Marsh wetlands along Steamboat Creek upstream of the confluence with Boynton Slough have been identified by FWS and the Nevada Department of Wildlife as an important regional waterfowl nesting and shorebird wintering area. A 300-acre area (Steamboat Marsh Nature Area) is proposed for marsh development with interpretive features within part of the

flowage area required along Steamboat Creek (Figure 25). Proposed habitat development would consist of creating several open water ponds totaling about 40 acres and marsh habitat totaling about 120 acres.

The resulting habitats of marsh, open water, and seasonally flooded land would provide significantly more value to migratory birds than now exists. The interpretive trails, including a boardwalk and paths, will lead from the information/interpretation facility into the marsh. This area would be purchased in fee.

To further enhance Lahontan cutthroat trout within the study area, groups of large boulders would be placed in the excavation areas at Booth Street and Arlington Avenue plus other selected locations where the river is wide.

Boulder groups would add cover habitat for young and adult fish and, when species recovery is complete, increase the number of catchable fish in these areas. Boulder groups would be located in lands required for flood control.

C. PLAN ACCOMPLISHMENTS

Plan accomplishments are presented in Table 27, the System of Accounts, and described below.

1. Flood Control.

This plan will provide 100-year level of protection to the study area from Truckee River flooding. The area along the Truckee River through downtown Reno would realize increased protection due to the project's increased channel capacity of 18,500 cfs (100-year design flow). Use of the detention basin would ensure that flows at and below Vista would be maintained at preproject levels. Although the project would only be designed to prevent flooding from all events up to and including the 100-year event, benefits would accrue from floods greater than the 100-year because of reduction in flood stage. Table 28 presents damages prevented for various flood events. Although the project would significantly reduce damages from the SPF event, $996 million in damages would still occur. Equivalent average annual flood control benefits to the study area would be reduced by about $9.7 million, 1984 price level, 8 3/8% interest rate. Approximately $250 thousand of average annual benefits is attributable to advanced replacement of bridges in the downtown Reno area. These bridges include Booth Street, Arlington Avenue, Sierra and Lake Street. The basis of these benefits is related to extending the useful life of an existing facility beyond the expected useful life. The information on remaining useful life was provided by the State of Nevada Highway Department. These benefits are quantified as a credit towards a portion of the costs to replace these bridges. Bridge replacement benefits were not claimed for the Virginia Street and Center Street bridges as the plans are to restore them in 3 to 5 years. Average annual flood control benefits under 1982 conditions would be approximately $4.4 million.

Recreation.

The potential recreation use for the years 1990 to 2040 was estimated using mathematical models to predict use for bicycling, rafting, and tubing and for general day-use activities. The use of other facilities was

estimated based on the capacity of the facilities to support use. The potential recreation use for each activity category was compared with maximum practical use (MPU) to determine the estimated use. The MPU is a measure of the total number of recreation days that can be supported by the recreation facility given the expected use pattern without degrading the resources. If the potential use for recreation exceeded the MPU, then the estimated use was limited to the MPU. The existing use of the existing parks and paths in the project area was estimated to be 961,000 recreation days per year. This was subtracted from the total estimated use to arrive at the use for the proposed recreation facilities (610,000 and 750,000 annual recreation days for 1990 and 2040, respectively). A summary of potential use, MPU and estimated use are shown in Table 29.

TABLE 27
SYSTEM OF ACCOUNTS

ITEM	NO ACTION ALTERNATIVE	SELECTED PLAN
PLAN DESCRIPTION	No action to be taken by Federal Government to reduce the frequency of flooding by either structural or nonstructural measures.	The plan will provide increased flood protection, enhance recreation, and improve fish and wildlife resources to the Reno-Sparks Truckee Meadows Metropolitan Area.
CONTRIBUTION TO THE PLANNING OBJECTIVE:		
1. Flood Control	No contributions to the planning objective.	Provides 100-year flood protection to the Reno-Sparks Truckee Meadows area primarily through bridge replacement, setback floodwalls, floodwalls, setback levees, channel excavation in four isolated areas, and an overflow detention area.
2. Recreation	No contribution to the planning objective.	Provides recreation features at 7 new parks/access sites and improvements to an existing park. The plan is composed of a mix of multipurpose day use facilities: bike and pedestrian paths, and river overlooks/observation decks.
3. Fish and Wildlife	No contribution to the planning objective.	Involves approximately 10 acres of riparian plantings on Steamboat Creek and the Truckee River, purchase and development of 300 acres into a marsh habitat area, and placement of boulders in the Truckee River to provide additional fish habitat.
4. Scenic Values	No contribution to the planning objective.	Involves the use of setback levees and setback floodwalls to minimize the impacts on existing parks and riparian vegetation.
NATIONAL ECONOMIC DEVELOPMENT:		
1. Total First Cost	None	$78,860,000
2. Annual Cost	None	$ 7,041,000
3. Annual Benefits		$13,265,000
4. Net Benefits		$ 6,224,000
5. B/C Ratio		1.9:1

TABLE 27
SYSTEM OF ACCOUNTS
(Continued)

ITEM	NO ACTION ALTERNATIVE	SELECTED PLAN
ENVIRONMENTAL QUALITY:		
1. Riparian and Wetland Vegetation	Much of the riverbank is public land; therefore, the overall amount of riparian vegetation is not expected to change due to local commitment to maintain and expand the Truckee River Greenbelt. Seasonally flooded pastures and other agricultural land between Huffaker Hills and the Truckee River are expected to be developed.	At least 23.2 acres of riparian vegetation and 2.6 acres of wetland vegetation will be removed during construction which will be fully mitigated. Approximately 10 acres of added riparian habitat by riparian plantings. Project levees have been aligned, where possible, to avoid mature riparian habitat. Acquisition of 300 acres in Steamboat Marsh and vicinity as a nature area will protect and enhance wetland vegetation.
2. Agriculture	Nonurban land in the Truckee Meadows is projected to decline significantly by the year 2000. Agricultural land adjacent to the river is undergoing conversion to industrial use, except UNAES land which is expected to remain agricultural.	900 acres of agricultural and seasonally flooded land would remain in permanent agricultural use through acquisition of flowage easements in the planned detention area.
3. Fish	No action taken to enhance fish resources. Fishery in the Truckee River is expected to improve due to continued efforts by local interests to restore the cui-ui and the Lahontan cutthroat trout.	49 acres of fish habitat temporarily disturbed due to in-channel excavation. Removal of riparian vegetation would result in a temporary loss of terrestrial insect drop as a food source and an increase in water temperatures due to shade loss. Riparian plantings on Steamboat Creek, when mature, would reduce temperatures thereby improving spawning conditions. Placement of boulder groups would improve habitat. Long-term fishery enhancement. Temperature improvements possible with proposed mitigation and enhancement.
4. Wildlife	No action taken to enhance wildlife resources. Wildlife species diversity and habitat could decline slightly due to loss of understory vegetation and adjacent industrial and urban development on agricultural lands.	Loss in riparian vegetation could cause a decrease in birds and small mammals until regrowth occurs. The 300 acre marsh development with open water ponds and marsh habitat would provide significantly more habitat to migratory birds and should maintain and enhance species diversity.
5. Rare, Threatened, and Endangered Species	Although general fishery conditions may improve, future populations of the cui-ui and Lahontan cutthroat trout will be determined largely by the success of the FWS recovery programs.	Turbidity controls and avoiding construction during spawning period would reduce silting of spawning gravel, temporary high water temperatures would result from removal of riparian vegetation. Once shade canopy is reestablished, requiring 10-15 years, water temperatures lower than present conditions would result, enhancing spawning conditions.

TABLE 27
SYSTEM OF ACCOUNTS
(Continued)

ITEM	NO ACTION ALTERNATIVE	SELECTED PLAN
6. Water Quality	Increased urbanization and accompanying runoff could result in long-term decrease in water quality. Flooding will continue to pose a hazard of water supply contamination.	Short-term degradation of water quality during construction due to sediment disturbance. Turbidity would be reduced with the use of flow diversions, siltscreens, and timing construction during low flows.
7. Esthetics	Esthetic values along the river should increase under the implementation of current and proposed recreation and beautification plans; however, esthetic values in the Meadows are expected to decrease due to residential and commercial development.	Construction activities and vegetation removal will cause esthetic degradation until re-vegetation is complete. Visual effect of structural improvements (e.g., displacement of bridges, construction of floodwalls) is largely subjective.
8. Cultural Resources	Potential or continued loss of archeological and historical sites to erosion, bridge recorded on National Register of Historic Places (NRHP) may be removed.	Loss of NRHP structure (Virginia Street Bridge) and 5 recorded bridges.
REGIONAL ECONOMIC DEVELOPMENT:		
1. Local Government Finance	Flood fight funding will continue. Loss of property tax revenue could occur due to flood damages.	Local governments must finance their share of project, and pay O&M costs. Emergency flood fighting costs would be reduced. Loss of property tax revenue because of flooding will be reduced due to increased flood protection. Local tax loss on federally purchased land in marsh area.
2. Land Use	Developers will continue to pressure farmers to sell their land for the development of industrial and residential complexes.	Construction at river's edge would be reduced. 300 acres in marsh restricted to a nature and recreation use.
3. Business and Industrial Activity	Tourist industry could be temporarily affected due to floods. Trucking/warehouse firm services would be interrupted during flooding.	Closing of businesses due to floodwaters or damages would be reduced (airport, trucking, etc.).
4. Public Facilities	Flood damages to sewage treatment plant, railroad, utilities, and roads would continue.	Flood damages to sewage treatment plant, railroad, utilities, and roads would be reduced. Expansion of public recreation facilities would occur.

TABLE 27
SYSTEM OF ACCOUNTS
(Continued)

ITEM	NO ACTION ALTERNATIVE	SELECTED PLAN
5. Public Services	Police, fire, ambulance, and water services would be interrupted by flooding.	Police, fire, ambulance, and water service interruptions caused by flooding would be reduced.
6. Displacement of Farms	Developers are pressuring farmers to sell their lands for new development.	Some agricultural land within the levee system would be converted to public recreation areas. Farmland in the proposed marsh nature area will be acquired and converted to recreation and wildlife use.
OTHER SOCIAL EFFECTS:		
1. Displacement of People	Temporary evacuation during flooding would continue.	Potential minor displacement along levee/floodwall alignment.
2. Recreational Opportunities	Open space is planned for along the Truckee River, but development is increasing adjacent to the river.	7 new parks/access sites and improvements to an existing park. Provides 610,000 average annual recreation days.
3. Transportation	Continued flood threat to existing roads and utilities.	Would provide additional protection to portions of Interstate 80 and the Southern Pacific Railroad.
4. Employment	Labor force is expected to increase with the increase in business and industry.	Jobs will be created during the construction period. Less disruption to work force as a result of less frequent flooding.
5. Safety	Continued development in the flood plain would increase hazard from flooding. Current flood problems pose a safety risk.	Safety will be significantly enhanced in the Truckee Meadows because of the reduced frequency and depth of flooding. Project features are included to ensure that flood events exceeding design conditions would not result in a catastrophe.
6. Energy	Energy consumption would continue to be high during flood fights.	Some increase in energy consumption due to construction and maintenance activities. Decrease in consumption due to fewer flood fights.

TABLE 28

FLOOD DAMAGES PREVENTED UNDER
PROJECT CONDITIONS FOR YEAR 1990

FLOOD EVENT	FLOOD DAMAGES PREVENTED ($1000)[1/]
50-year	42,000
100-year	281,000
SPF	1,100,000

1/ 1984 Prices

TABLE 29
RECREATION AND FISH AND WILDLIFE USE ESTIMATES

LOCATION OF SITE	POTENTIAL USE 1990	POTENTIAL USE 2040	MAXIMUM PRACTICAL USE	ESTIMATED USE 1990	ESTIMATED USE 2040
RECREATION*					
GENERAL RECREATION					
Along Truckee River	313,000	453,000			
Truckee Meadows Area (Pembroke 1/)	88,000	88,000			
Total	401,000	541,000	3,103,000	401,000	541,000
BICYCLING					
Along Truckee River	617,000	1,302,000			
Truckee Meadows Area 2/	350,000	350,000			
Total	967,000	1,652,000	808,000	808,000	808,000
RAFTING AND TUBING					
Along Truckee River					
Total	482,000	821,000	276,000	276,000	276,000
FISHING 3/ 4/ **					
Along Truckee River					
Total	86,000	105,000	90,000	86,000	90,000
Subtotal Recreation along Truckee River	1,498,000	2,681,000	Subtotal	1,571,000	1,715,000
Subtotal Recreation Truckee Meadows Area	438,000	438,000	Existing Use	-961,000	-965,000
Total Potential Use	1,936,000	3,119,000	Total Estimated Use	610,000	750,000
FISH AND WILDLIFE*					
NONCONSUMPTIVE USE					
Truckee Meadows Area					
Steamboat Marsh	152,000	152,000	152,000	152,000	152,000
Steamboat Creek	20,000	20,000	20,000	20,000	20,000

1/ Site 9 - Potential use based on 50-parking space capacity.
2/ Potential use based on capacity of 9.83 miles of path.
3/ Benefits derived from fishing included in Fish and Wildlife Enhancement.
4/ Source: FWS Fish and Wildlife Coordination Report, April 1984.
* Recreation Days.
** Angler Days.

Revised July 1985

Recreation benefits for the facilities along the Truckee River have been calculated by the travel cost method. Recreation use was estimated by using mathematical models that relate distance to potential recreation use. Benefits were calculated using the same models to determine how many more miles users would travel to obtain the same experience if the features were located further away. The value of the added travel was calculated based on the cost of operating a vehicle and the value of travel time. The value per mile was $0.51. The recreation use along the Truckee Meadows area could not be estimated using available travel distance models. The estimated use was calculated based on the capacity of the facilities and unit values were used to determine benefits. The benefits for fishing use were computed using potential use information developed by the FWS and applying the travel cost value of $3.72 per recreation day. The features that will contribute to stream fishing use include the access facilities and the boulder habitat improvements planned for the Truckee River. The fishing use potential was estimated by FWS to be 90,000 angler days per year. The planned facilities would increase the present 13 miles of public access to 18 miles. This 39% increase in access would support 25,000 angler days of new fishing use per year. Using a travel cost value of $3.72 determined from the analysis of general recreation, rafting and bicycling activities, the benefits of the additional stream fishing use was estimated to be $93,000. The total recreation use is estimated to be 610,000 recreation days for year 1990 and 750,000 recreation days in year 2040. Total annual recreation benefits at 8-3/8% interest rate over a 50-year period of analysis are $2,395,000.

3. Fish and Wildlife.

The selected plan would result in opportunities to enhance fish and wildlife uses including stream fishing and nonconsumptive uses at the Steamboat Marsh Nature Area and along Steamboat Creek. The enhancement plan would contribute to two Federal programs: the Migratory Bird Conservation Act and the Endangered Species Act. The Migratory Bird Conservation Act provides for habitat as sanctuaries for migratory birds. This area is nesting and wintering habitat to about 20 species of waterfowl (including Canada geese, mallards, canvasbacks), about 18 species of shorebirds (including killdeer, spotted sandpipers, long-billed curlews), several wading birds (great blue herons, snowy egrets), a variety of songbirds, and some raptors (including marsh hawks, Swainson's hawks, barn owls). Some of the highest Canada goose populations in the State occur in the Truckee Meadows with the marsh providing most of the nesting habitat. Present goose production is about 60-70 young per year. About 400 to 500 ducks are hatched in the Meadows; most nesting occurs in the marsh (about 360 ducks hatched). Annual waterfowl use days (excluding geese) are estimated at 100,000. The following species are listed as "sensitive" (species which could become Federally listed as endangered or threatened in the foreseeable future) and are known to inhabit the existing marsh: white pelican, Swainson's hawk, willow flycatcher, and loggerhead shrike.

The proposed management would provide about three times the present acreage of marsh and open water habitat which would allow increases in bird numbers using the marsh. The Canada goose production would be about 120 young annually. Duck production, according to FWS estimates, would be about 2,750 young hatched per year. This would be a net gain of about 2,450 birds per year. Annual waterfowl use days (excluding geese) expected to occur with

the expanded open water and marsh areas would annually average 545,000. Increased nesting numbers can be expected from great blue herons, black-crowned night herons, willets, and Forster's terns. All presently occurring migratory bird species would be expected to increase significantly with the additional habitat.

Protection and management of the marsh would also contribute to the Endangered Species Act by assisting the FWS in the recovery of the endangered cui-ui and threatened Lahontan cutthroat trout by reducing water pollution. FWS has recommended in their Coordination Act Report (EIS Attachment 3) and in their Biological Opinion (EIS Attachment 4) enhancement measures and the Corps of Engineers agrees to the proposals. The Steamboat Marsh has the capacity to remove some of the pollutants such as dissolved solids, suspended solids, and nitrates from the waters entering Steamboat Creek and ultimately, the Truckee River. Nutrient stimulation of aquatic vegetation has been documented as a cause of substandard oxygen levels in the Truckee River. Nutrient stimulation is also believed to be the major contributor to a low intragravel dissolved oxygen level which precludes spawning success.

Steamboat Creek drains a large area which is rapidly being converted from agricultural to urban use. By year 2000 Steamboat Creek would be contributing one-third (103 cfs) of the urban drainage from a 2-year summer storm in Truckee Meadows. Presently, water quality in Steamboat Creek is poor. Suspended solids and nutrients are already a problem. With existing land use, suspended solids reach 22,000 pounds per hour and total phosphorous reaches 2 pounds per hour during high water. By 2000 these figures would reach 39,000 and 35 pounds per hour for suspended solids and total phosphorous, respectively. Both these parameters detrimentally impact fisheries in the lower Truckee River, including the ongoing recovery efforts for Lahontan cutthroat trout and cui-ui.

The proposed management would assist in providing an adequate level of water quality in the Truckee River for all life stages of both fish species. FWS estimates between 30 and 45 pounds of phosphorous per day would be removed by the marsh. This would reduce the Truckee River load by 14 percent. Nitrogen would also be removed to a similar proportion.

The benefits for fish and wildlife have been computed using a 50-year period of analysis and an 8-3/8 percent interest rate. The benefits for the nonconsumptive uses were determined using the unit value method with a total of 70 points from Table VIII-3-2 and a unit value of $4.50 from Table VIII-3-1 from Principles and Guidelines (October 1984 price levels). The value of the contribution to the National Migratory Bird Conservation Act program was estimated by the travel cost method using a travel cost value of $38.56 and 4,000 hunter use days. Hunting use is estimated to result in an annual benefit of $154,000.

Features of the plan that will contribute to the FWS Endangered Species program by assisting in the recovery of the cutthroat trout and the cui-ui are the Steamboat marsh development, the increased riparian plantings, and the stream habitat improvements. These have been evaluated using a single-purpose, least-cost analysis and the contributions are estimated to have an annual benefit of $225,000.

Nonconsumptive use such as nature interpretation, bird watching and photography would occur within the planned Steamboat Creek and Steamboat Marsh fish and wildlife enhancement areas. The FWS estimated 20,000 user days would occur along Steamboat Creek. The Corps analysis determined that the capacity of the Steamboat Marsh facilities would be 149,000 user days per year and 3,000 off-site user days per year. The total of 172,000 user days per year was estimated to have a unit value of $4.50 and annual benefits of $774,000.

The fish and wildlife benefits are summarized as follows:

Nonconsumptive Use	$ 774,000
Hunter use	154,000
Contribution of Endangered Species Program	225,000
Total Fish and Wildlife Benefit	$1,153,000

The benefits claimed for the endangered species program are for the improvements in habitat for the cutthroat trout and the Cui-ui. There are many measures that would assist in the conservation and recovery of these species. In the absence of the planned project, production of cutthroat trout and Cui-ui could be assisted by: stocking hatchery raised fish; providing easements and fencing to restrict cattle grazing next to the river; establishing riparian habitat to provide cover, shade and food supply; providing additional water supplies; and reducing the amounts of nutrients and heavy metals that enter the Truckee River. For the proposed measures, the alternatives are either more costly (Hatchery production, tertiary sewer treatment, land acquisition and development in the Steamboat Creek area and along the Truckee Rive, restricting agricultural water supplies, etc.) or could be most effectively done by the proposed measures. The FWS and State Fish and Game agencies have programs to conserve and promote migratory birds. These programs include habitat improvement, provision of water supplies, refuges, and in some cases easements to promote migratory bird values. The proposed development and management of the Steamboat Marsh would be less costly than alternative means.

Costs and benefits for each incrementally separable fish and wildlife enhancement feature are as follows:

	Cost	Benefit
Fish habitat improvement	$6,500	$6,500
Marsh development	$391,000	$1,063,000
Riparian planting	$29,000	$83,000

In addition, the marsh enhancement plantings will assist in improving the esthetics and setting of the area for public use.

4. Summary.

The selected plan provides $9,717,000 annual flood control benefits, $2,395,000 annual recreation benefits, and $1,153,000 annual fish and wildlife benefits for a total annual benefit of $13,265,000.

TABLE 30

EFFECTS OF THE SELECTED PLAN ON RESOURCES OF NATIONAL RECOGNITION

TYPES OF RESOURCES	AUTHORITIES	MEASUREMENT OF EFFECTS
Air quality	Clean Air Act, as amended (42 U.S.C. 1857h-7 et seq.)	No effect.
Areas of particular concern within the coastal zone	Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1451 et seq.)	Not present in planning area.
Endangered and threatened species	Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.)	Temporary disturbance to 49 acres of habitat for Lahontan cutthroat trout; potential temporary temperature increase for cutthroat and cui-ui. Long term temperature decrease and reduced pollutants will enhance two listed fish species through project enhancement measures.
Fish and wildlife habitat	Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.)	Fish habitat: Short-term degradation to 40 acres, long-term improvements; wildlife habitat: Temporary loss of 22.9 acres along Truckee, and 0.3 acres along North Truckee Drain and Peoples Drain, loss of 2.6 acres along Boynton Slough. Gain of 169 acres of wildlife habitat..
Floodplains	Executive Order 11988, Floodplain Management	UNAES land remains agricultural; Steamboat Marsh remains permanent wetland.
Historic and cultural properties	National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et. seq.)	Loss of bridge (Virginia Street Bridge) listed in the National Register of Historic Places; loss of 5 additional state recorded bridges.
Prime and unique farmland	Farmland Protection Act of 1982	20.6 acres of prime farmland lost. SCS rating form predicting farmland impacts completed and being coordinated.
Water quality	Clean Water Act of 1977, as amended (33 U.S.C. 1344, et seq.)	Water quality improvement with gain in wetlands.
Wetlands	Executive Order 11990, Protection of Wetlands; Clean Water Act of 1977, as amended (33 U.S.C. 1344, et seq.)	Loss of 2.6 acres of wetlands along Boynton Slough; gain of 160 acres open pond and marsh habitat around Steamboat.

D. EFFECTS OF THE PLAN ON THE ENVIRONMENT

The effects of the selected plan on resources receiving national recognition and the compliance of the selected plan with environmental statutes are summarized in Table 30 and in Table 1 of the EIS.

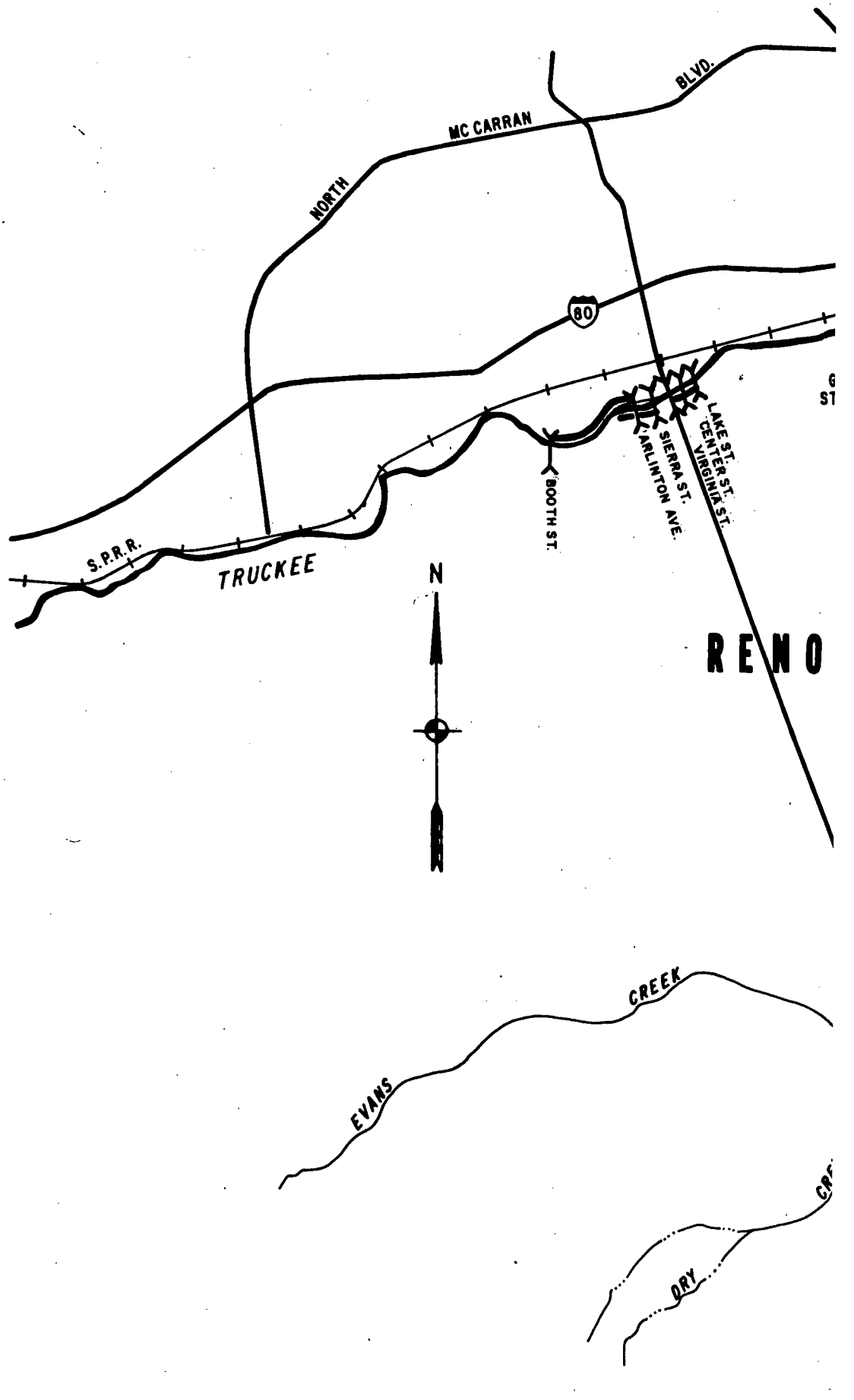
Construction of the flood control features will detrimentally impact fish and wildlife habitat. Table 31 lists the amount of significant habitat disturbed by the selected plan. Figure 26 shows locations of the riparian and wetland habitat impact.

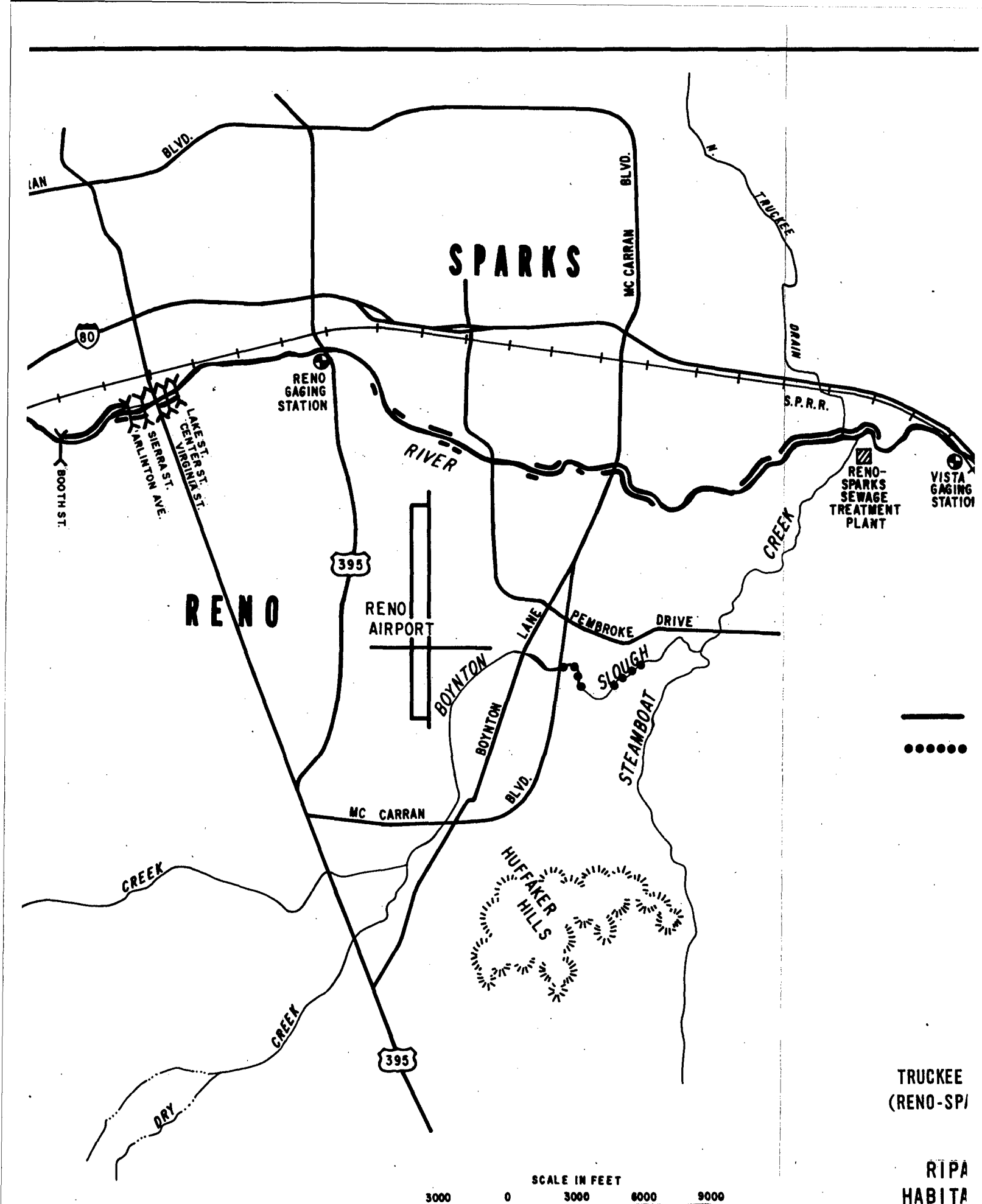
Temporary and permanent losses of riparian habitat would occur from construction activities required for excavations, floodwalls, bridge replacements, and levees. Loss of riparian habitat would cause a decrease in birds and small mammals in the study area. Riparian vegetation loss would also mean a loss of insect food input to the river for fish. Vegetation loss on the south bank and on some north bank sites would lessen water shading which is an important factor in keeping water temperatures low for fish spawning and egg and young survival. About 1.3 miles of riparian vegetation which shades the river would be removed. The maximum temperature increase expected is 1.6°F which is not expected to significantly affect the cold water fishery in the Truckee River when riparian mitigation is initiated with construction.

The wetland loss along Boynton Slough would be mostly a permanent loss of emergent vegetation at the edges of the slough where the levees would be placed.

TABLE 31
SELECTED PLAN IMPACTS ON HABITAT

DESCRIPTION	AREA (Acres)
Existing Riparian Habitat	
Truckee River	223.0
Existing Wetland Habitat	
Boynton Slough	20.9
Habitat Removed	
Truckee River	22.9
Boynton Slough	2.6
North Truckee Drain	0.3
Annual Loss	25.1
Adjustment for establishment period	6.3
Total Mitigation	31.4
Existing Fish habitat	
Truckee River	129.0
Fish Habitat Temporarily Disturbed By In-Channel Excavation, Floodwalls, and Bridge Replacements	49.0


BLVD.
MC CARRAN
NORTH
80
S.P.R.R.
TRUCKEE
BOOTH ST.
ARLINTON AVE.
SIERRA ST.
LAKE ST.
CENTER ST.
VIRGINIA ST.
N
RENO
EVANS
CREEK
DRY



TRUCKEE
(RENO-SP

RIPA
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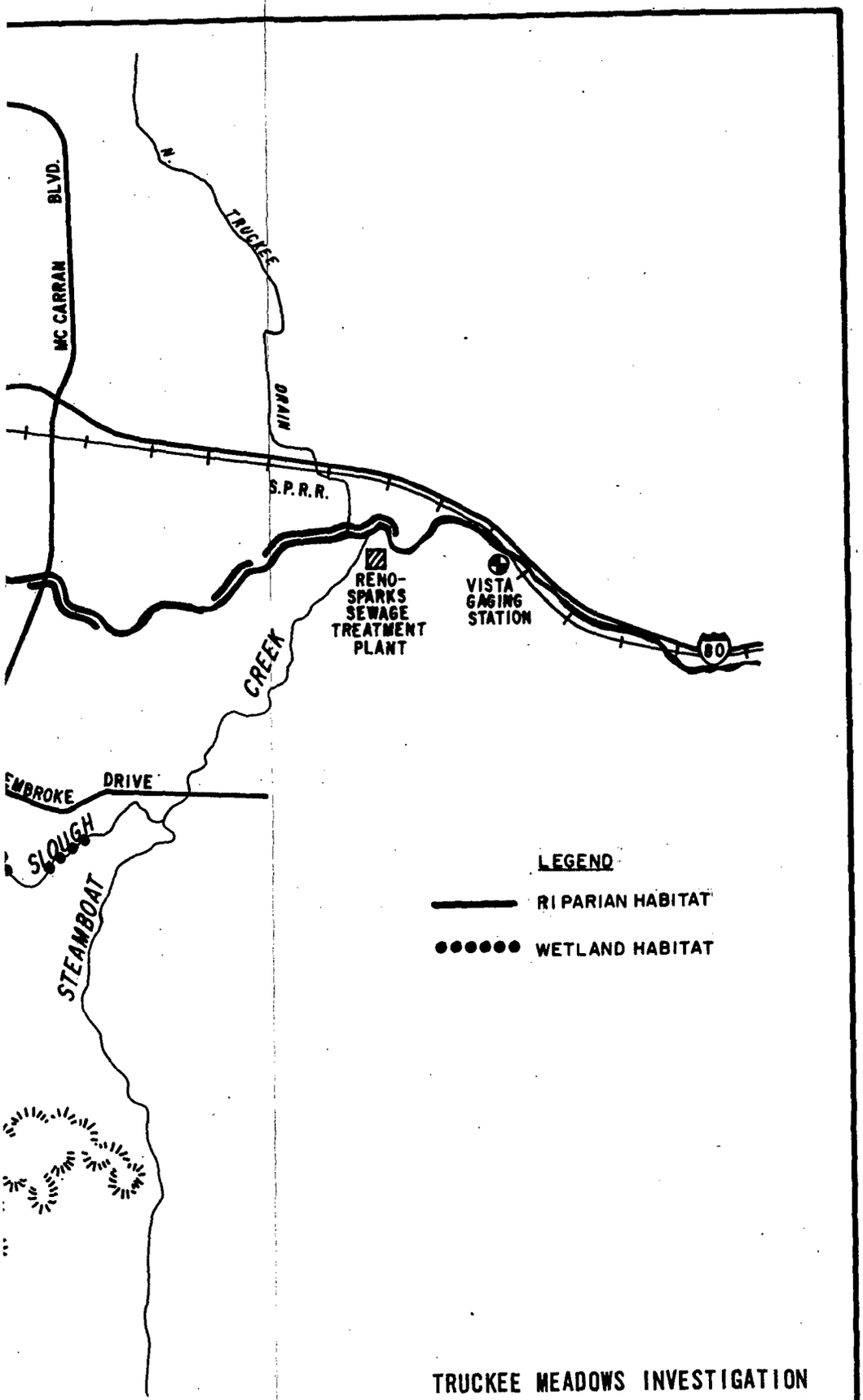


TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

RIPARIAN AND WETLAND
HABITAT IMPACT LOCATIONS

3 SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1984

FIGURE 26

No significant impacts to wildlife habitat will occur where levees are constructed on grass and farmland areas because the levees will be replanted to grasses and forbes.

Construction activities for in-channel excavation, downtown area floodwall placement, bridge replacement, and diversion realignment would involve movement of gravel and boulders which will temporarily disturb fish habitat. The excavation will require removal or movement of bottom materials over about 17 acres of river bottom. The construction activities in the downtown area from Booth Street to Lake Street will require disturbance of bottom habitat and dewatering of banks which will cause fish to temporarily move. Turbid water can cause spawning gravel spaces to fill in, which contributes to low dissolved oxygen levels, and can cause gill damage. Turbidity level increases are expected to decrease water quality over an additional 32 acres. After construction activities are completed, bottom habitat conditions are expected to be similar to existing conditions. Bottom dwelling organisms should repopulate to preproject levels within 6 months.

The excavation immediately below Wingfield Diversion would produce an impediment to upstream movement by fish because of the resulting diversion structure height.

The objective of Executive Order 11990, Protection of Wetlands, is to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practical alternative. Federal agencies are required to provide leadership and take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands.

The selected plan is in compliance with Executive Order 11990. The temporary loss of 23.2 acres of riparian vegetation along the Truckee River and North Truckee Drain and Peoples Drain, and 2.6 acres of emergent wetlands along Boynton Slough, will be fully mitigated utilizing advice from the FWS. The fish and wildlife enhancement features include the acquisition of 300 acres in the Steamboat marsh and adjoining wetlands as a nature area to permanently preserve and manage the wetland vegetation. This acquisition would result in 40 acres of open ponds and 120 acres of wetland vegetation in addition to the 55 acres already existing.

Approximately 900 acres of agricultural land and seasonally flooded land would remain in permanent agricultural use through acquisition of flowage easements in the planned detention basin. About 20.6 acres of prime agricultural land would be lost to levee construction. Flooding of farmlands will be less frequent; flooding will continue to periodically replenish the soil with mineral nutrients from suspended sediment deposition.

There would be a short-term degradation of water quality during construction from sediment disturbance. This turbidity would be reduced with use of flow diversions, silt screens, and timing construction during low flows.

Construction activities and vegetation removal will cause esthetic degradation until revegetation is completed. The visual effect of structural

improvements is largely subjective. Replacement of old style bridges with new structures may be perceived as diminishing the historical/esthetic character of the downtown area. The six bridges proposed for replacement are recorded by the Nevada Historical Society and the Virginia Street Bridge is also on the National Register. Construction of new levees and floodwalls may also be considered by some as a visual intrusion on the "natural" qualities of the river. However, as urban uses border much of the river, grassed levees may actually act as a visual buffer more in keeping with the riverine environment.

The selected plan has a potential to impact the threatened Lahontan cutthroat trout and endangered cui-ui. Silting of spawning gravel within the study area is a potential problem, but controlling turbidity and avoiding construction during spawning periods would reduce the problem. Due to the changeable nature of river gravels, further studies will be undertaken after authorization to identify the actual location of spawning gravels which could be impacted. High water temperature is now a primary obstacle to Lahontan cutthroat trout and cui-ui use of the river. It is estimated that the plan could temporarily raise the temperature approximately 1.6°F higher than the normal rise under the greatest warming conditions (high air temperature, low river flow) at the downstream end of the study area. FWS has stated that temperature changes could affect the cui-ui spawning success below Derby Dam. This impact would be a rare event and would occur only during the 10 to 15 years required for the shade canopy to become fully reestablished. The selected plan, including riparian vegetation enhancement would result in lower water temperatures and better water quality than is expected to occur without the project, once the vegetation is reestablished.

The objective of Executive Order 11988, Flood Plain Management, is to restore and preserve beneficial values served by flood plains and avoid to the extent possible the adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of flood plain development wherever there is a practicable alternative. Federal agencies are required to provide leadership and take action toward the fulfillment of this objective.

The selected plan is in compliance with Executive Order 11988. Flood control features will not have a significant impact on current or future land use:

- The present flood plain within the downtown Reno area is fully developed. The selected plan will provide additional protection to this development.

- Land in the current flood plain below U.S. 395 is expected to be fully developed prior to project construction. This development would occur with or without project construction.

- Land within the detention basin will remain in agricultural use with the project. Also, added flood protection is provided to the area.

- Land in the Steamboat marsh area will remain permanent wetland because of the establishment of the Steamboat Marsh Nature Area.

E. PROJECT FLOOD CONTROL OPERATION

The flood control operation has been designed to provide 100-year level of flood protection to the Reno-Sparks Truckee Meadows area. Floodflows would be confined to the Truckee River through downtown Reno to the McCarran Boulevard crossing. Below McCarran Boulevard controlled flooding would occur within the detention basin on UNAES lands and Steamboat Creek floodway. For floodflows exceeding project design, overtopping would occur by a combination of variable freeboard heights and side spilling weirs at predetermined locations along project features. Drainage of interior areas protected from Truckee River flooding would not be adversely affected by the project as a result of various interior flood control features. The following discussion will provide additional information on the project operation. The discussion will describe in detail the operation of the project during the 100-year and SPF event. Figure 27 displays the SPF flood plain for project and preproject conditions and will be used to discuss flood events exceeding project conditions. Information on interior flood control features is provided in section E-8. Table 32 presents peak discharge data for both project and preproject conditions for the SPF event.

Sizing of the detention basin and hydraulic design of its appurtenant features are based on hydraulic and hydrologic analysis of the Truckee River and Steamboat Creek using computer program HEC-2 (steady flow hydraulic model) and computer program HEC-1 (hydrologic model). The flow characteristics associated with the operation of the detention basin are unsteady. Therefore, it is recommended that during advanced engineering studies more detailed analysis be conducted including unsteady flow modeling and/or physical modeling of the area.

1. Truckee River from Reno City Limits (West Side) to Booth Street (Reach 1)

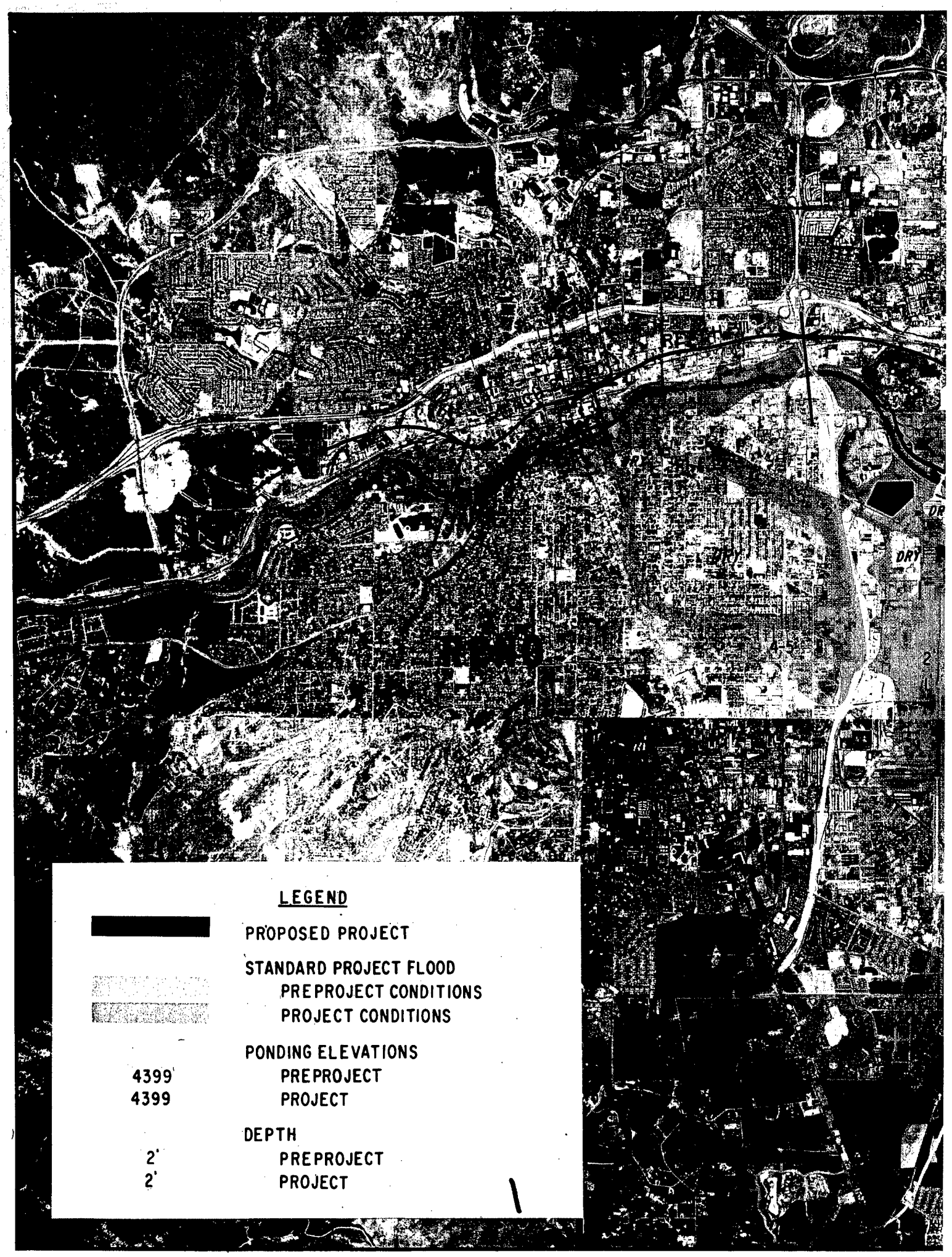
a. Project features. - None.

b. 100-year and SPF. - The 100-year flood plain in Reach 1 is generally confined to the main channel and is not expected to cause damage. Because no improvements are required in this reach, both peak discharges and flood plains would not change from preproject conditions.

2. Truckee River from Booth Street to Lake Street (Reach 2)

a. Project features include. -

- Floodwalls on the north bank from Booth Street bridge to Lake Street bridge
- Floodwalls on the south bank from Washington Street to Lake Street bridge
- Channel excavation in the vicinity of Booth Street bridge and both channels surrounding Wingfield Park
- Replacement or elevation of seven bridges - Booth Street, Arlington Avenue, Sierra Street, Virginia Street, Center Street, Lake Street, and the pedestrian bridge at Wingfield Park.



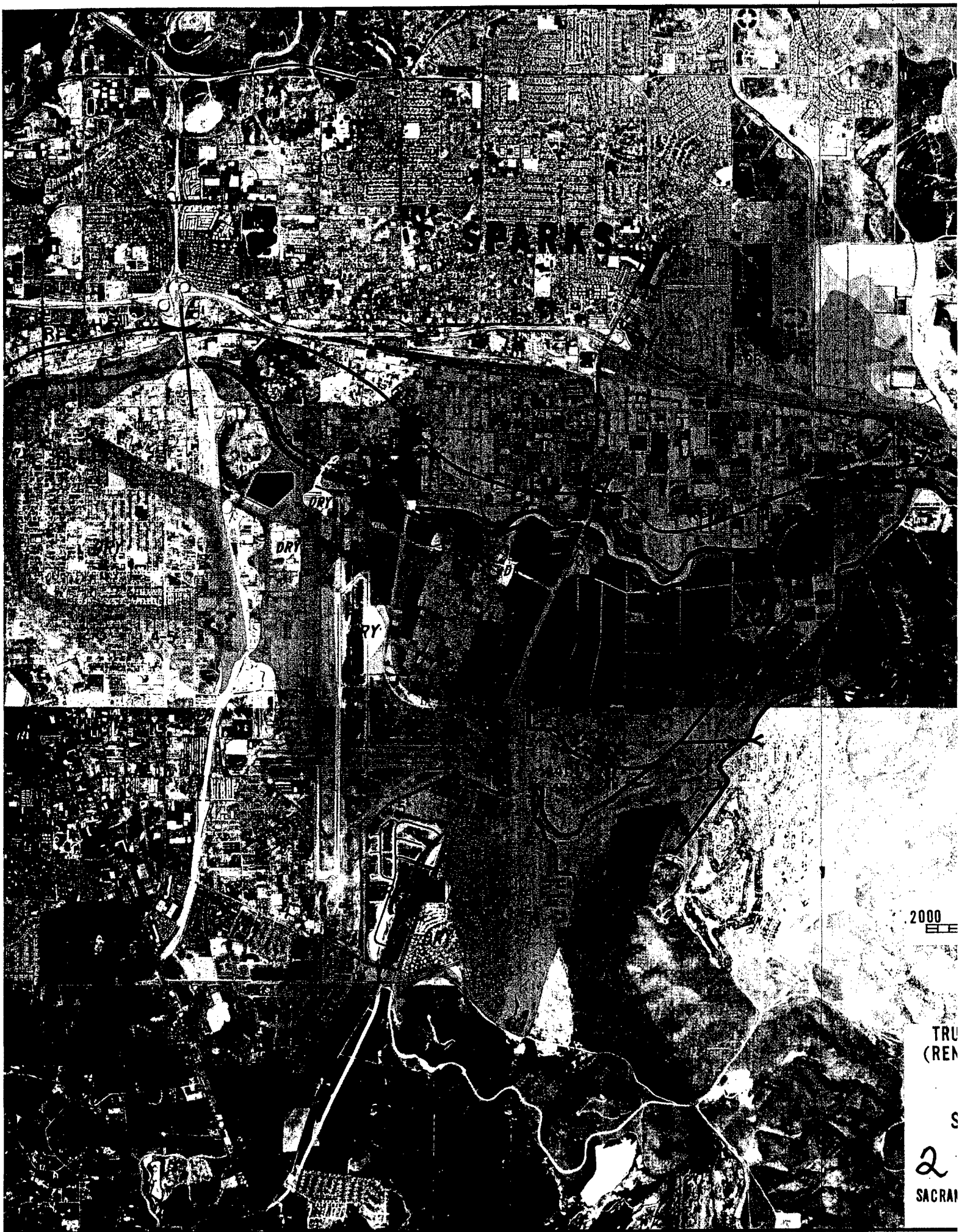
LEGEND

PROPOSED PROJECT

STANDARD PROJECT FLOOD
- PREPROJECT CONDITIONS
- PROJECT CONDITIONS

PONDING ELEVATIONS
- 4399 PREPROJECT
- 4399 PROJECT

DEPTH
- 2' PREPROJECT
- 2' PROJECT


SPARKS
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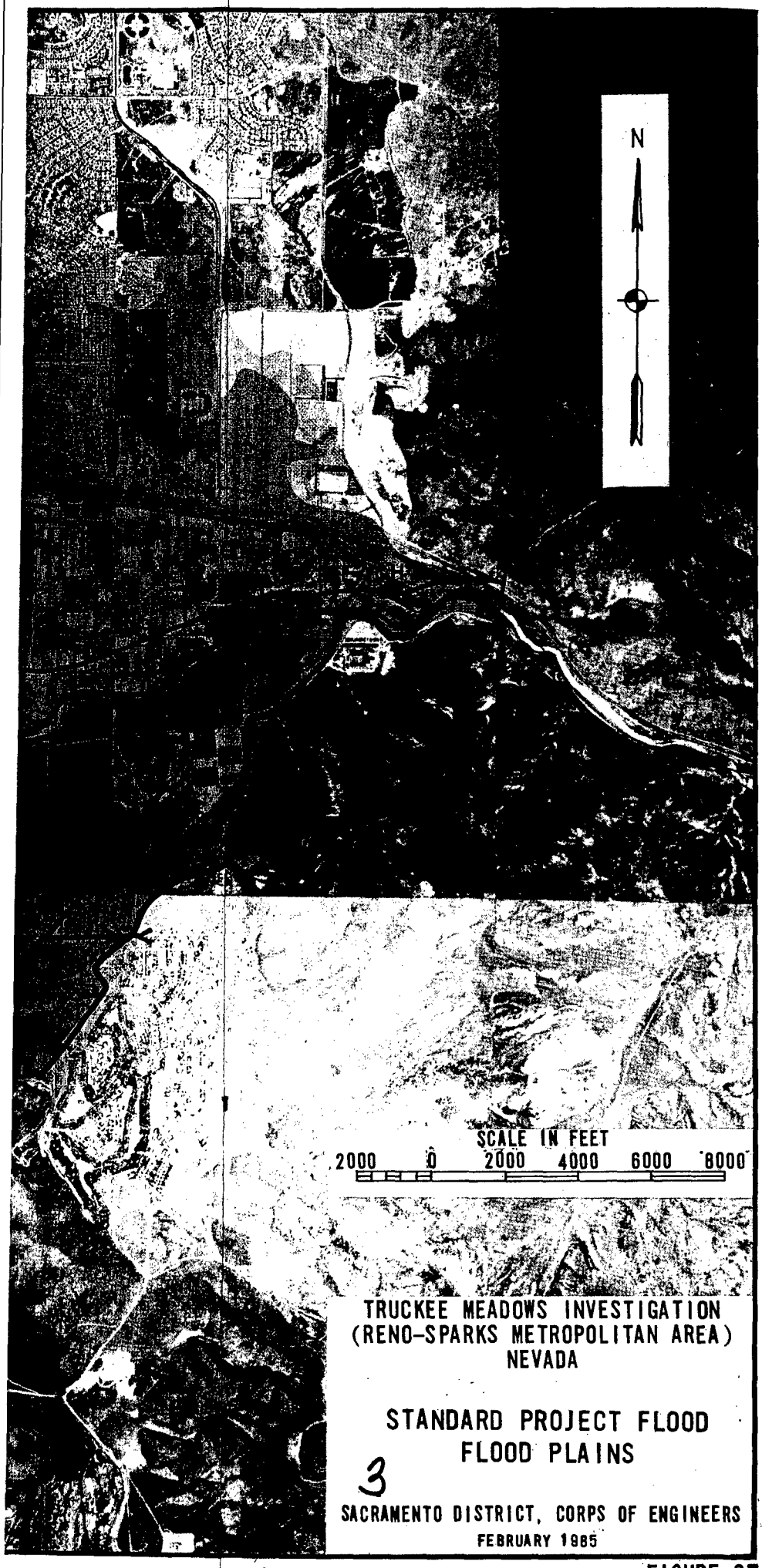
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SCALE IN FEET
2000 0 2000 4000 6000 8000
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
STANDARD PROJECT FLOOD
FLOOD PLAINS
3
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 27

TABLE 32
TRUCKEE RIVER PEAK DISCHARGES
DURING SPF EVENT

Reach	Peak Discharge (CFS)		Total Breakout Volume (AF)[1/]	
	Preproject	Project	Preproject	Project
1	39,800	39,800	-	-
2	33,900	38,200	5,400	700
3	33,900	38,200	-	-
4	18,800	24,500	18,100	11,600
5/6	36,700	31,300	17,700	4,100
TOTAL			41,200	16,400

1/ Breakouts represent floodflows leaving the main Truckee River Floodway (main channel and overbank for preproject conditions) thereby reducing the total river flow. Project condition breakouts are excess floodflows overtopping project features. Floodflow breakouts can either return to the river system downstream, leave the river entirely and flow towards the Boynton Slough/Steamboat Creek flood plain, or flow towards the Sparks area north of the river.

b. 100-year design event. - Channel capacity of Reach 2 will be increased to 18,500 cfs (peak discharge of the 100-year event). Channel velocities are high, ranging from 12 to 14 feet per second (fps), but would not pose any erosion problems. Revetment would be provided at excavation areas.

c. SPF event. - During the SPF event floodflows would outflank project features and proceed downstream following historical flood plain patterns. South of the river excess floodflows would leave the main Truckee River floodway and continue in the southerly direction towards the Cannon International Airport. Under project conditions the volume of excess floodflows would be less than the excess during preproject conditions. This is due to the increased flow carrying capacity of the river channel causing less flow to leave the Truckee River. The peak discharge within reach 2 is 38,200 cfs as opposed to 33,900 cfs during preproject conditions.

3. Truckee River from Lake Street to U.S. 395 (Reach 3)

a. Project features. - None.

b. 100-year design event. - Within Reach 3 no flood control improvements are required as the existing channel would carry the 100-year design floodflows.

c. SPF event. - During the SPF event excess flows from Reach 2 would converge into Reach 3 with the exception of floodflows departing south towards the airport. The added flows entering Reach 3 during the SPF event as a result of the increased capacity of Reach 2 would be insignificant in terms of flood plains and velocities.

4. Truckee River from U.S. 395 to McCarran Boulevard (Reach 4)

a. Project features include. -

- Setback levees and floodwalls on the north bank from Glendale Avenue to McCarran Boulevard
- Setback levees and floodwalls on the south bank from U.S. 395 to McCarran Boulevard
- Excavation on north bank at Glendale Park
- Realignment of North Truckee Ditch Diversion Dam (Supply ditch for Glendale Water Treatment Plant will be realigned in conjunction with the diversion structure.)

b. 100-year design event. - The channel capacity of Reach 4 has been increased to 18,500 cfs. Channel velocities remain high but would not pose any erosion problem.

c. SPF event. - During an SPF event under project conditions, excess flows north of the river would overtop project features near U.S. 395 highway and continue parallel to the river course where ponding would occur in the Sparks industrial area. South of the river overtopping would occur near the MGM hotel complex and proceed towards the airport combining with upstream flows from Reach 2. Additional overbank flows along the south bank near South Rock Boulevard would proceed towards the UNAES and the Steamboat

marsh area. All overtopping would occur over side spilling weirs embedded in the protective works. Due to the increased capacity along the Truckee River, less flow would occur along overbank areas than would occur during preproject conditions. Freeboard from 3 to 6 feet was used for levees and floodwalls to insure that any overtopping would occur only at locations where preproject overtopping occurred. The project condition peak flow within the Truckee River is 24,500 cfs as opposed to 18,800 cfs during preproject conditions.

5. Truckee River from McCarran Boulevard to Mouth of Steamboat Creek (Reach 5)

a. Project features include. -

- Setback levees on north bank extending from McCarran Boulevard downstream to mouth of Steamboat Creek.
- Detention basin located in the UNAES area. The basin is bounded on the north by the Truckee River, on the east by the Steamboat Creek overflow area, on the south by Pembroke Drive, and on the west by McCarran Boulevard. The detention basin area is surrounded by levees averaging 10 to 11 feet high. Truckee River flows will enter the basin over a weir located on the upstream end of the overflow area (approximately 1,000 feet downstream of McCarran Boulevard on the right bank). The sharp crested weir is approximately 1,000 feet long with a crest elevation of 4394.2 (an elevation equivalent to the Truckee River water surface at a discharge of 10,500 cfs). Excavation is required at the weir entrance. A lower weir to drain the basin is located on the eastern side of the detention basin. It is a sharp crested weir 250 long with a crest elevation of 4393.0. A gated outlet structure, to permit complete drainage of the area, is located along the eastern boundary levee of the basin, approximately 2,500 feet north of Pembroke Drive on an existing drainage channel. The outlet consists of two 48-inch reinforced concrete pipes with an entrance invert elevation of 4379.5 feet. Each conduit is separately controlled by a manually operated gate in addition to flap gates at the downstream end. The low level outlet will empty into the Steamboat Creek area.

  To avoid significant flooding in the Sparks industrial area resulting from Truckee River backwater and high interior runoff flows which occur during the general rain design storm, backwater levees will be constructed along the downstream reaches of the North Truckee Drain and Peoples Drain. The top of levee elevation will be approximately 4394 feet NGVD. The levees will be built on both sides of the North Truckee Drain from where it enters the Truckee River upstream to I-80. Here, the left bank levee will tie into the highway embankment. The right bank levee will follow the North Truckee Drain and Peoples Drain as the ditch runs parallel to the Southern Pacific Railroad alignment. Along this stretch, the railroad embankment will serve to contain the flows on the north side, with levees only along the south side of the ditch. North of I-80, the

North Truckee Drain splits off of the highway ditch at two points. The levees will line both legs of ditch until they merge, approximately 900 feet north of I-80, and tie into high ground.

b. 100-year design event. - All Truckee River flows up to 10,500 cfs (approximately the 35-year event) will proceed undiverted past the upper weir down the Truckee River. All flows greater than 10,500 cfs will have a portion of the flow diverted into the detention basin. The 100-year peak discharge in the Truckee River approaching the upper weir is 18,500 cfs. The peak discharge over the upper weir during this event is about 5,600 cfs. The undiverted flow past the weir therefore is about 12,900 cfs.

Floodflows in the detention basin are stored temporarily and released later after passage of the major flood peak. The peak stage in the detention basin during the project design flood is elevation 4395.1. The peak discharge over the lower weir during the project design flood is 3,000 cfs. The 100-year preproject flow at the Vista stream gage is 19,900 cfs, and this flow was the controlling discharge in the design and sizing of the detention basin and its appurtenant features.

c. SPF event. - During the SPF event, overbank flows from Reach 4 would proceed into the overbank areas of Reach 5 and pond behind levees. Also, additional overflows from the river would occur into the industrial area near the confluence with North Truckee Drain. South of the river, excess flows would fill the detention basin and the Steamboat overflow area. Levees surrounding the detention area have been sized so that overtopping would not occur behind project features.

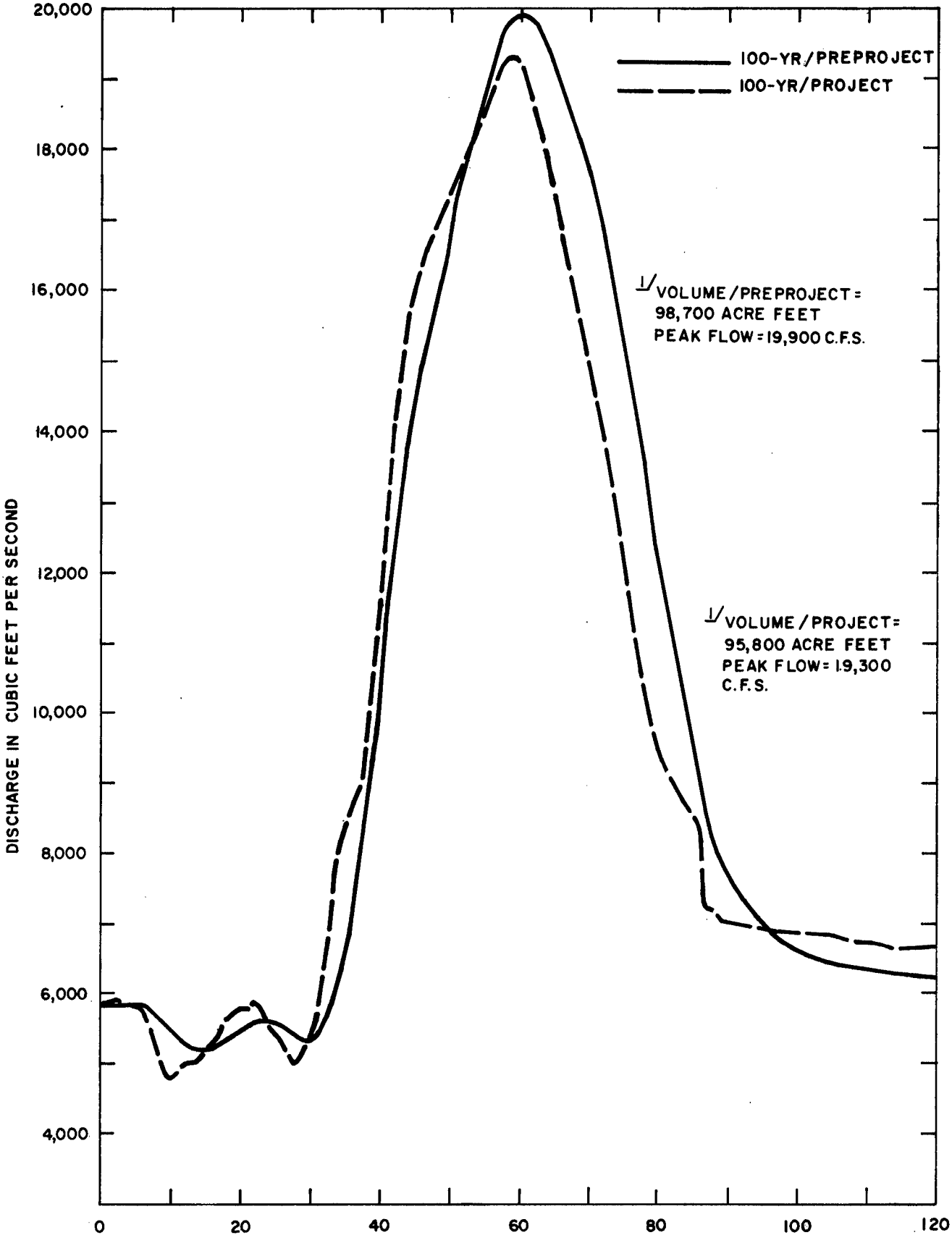
6. Truckee River from the Mouth of Steamboat Creek to Vista Including Steamboat Creek and Boynton Slough (Reach 6)

a. Project features in this reach include:

- Setback levees on north bank of Truckee River to I-80 tie-in
- Setback levees on east side of Steamboat Creek
- Setback levees along north bank of Boynton Slough from McCarran Boulevard bridge to Pembroke Drive bridge on Steamboat Creek
- Setback levees on western border of Steamboat Valley, south of Boynton Slough
- Replacement of Pembroke Drive bridge

b. 100-year design event. - Floodflows enter this reach from several sources: 1) Truckee River flows remaining in the river (no diversion into detention basin), 2) Steamboat Creek and Boynton Slough, and 3) outlet flows from the detention basin.

Total volume in the Truckee River represents approximately 77,600 acre-feet with a peak discharge of 12,900 cfs. Boynton Slough and Steamboat Creek drain into this reach with total volume equal to 10,600 acre-feet and a combined peak discharge of 5,400 cfs. The total volume stored in the detention basin is 9,200 acre-feet with a peak flow of 3,000 cfs over the lower weir. These hydrographs are combined and routed to produce a total hydrograph at Vista. Figure 28 displays the 100-year preproject and project



1/ VOLUME REPRESENTS THAT VOLUME ACCUMULATED OVER A 5-DAY (120 HR.) PERIOD.

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

TOTAL FLOW AT VISTA
UNDER 100-YEAR FLOOD
CONDITIONS

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

FIGURE 28

condition hydrographs at Vista. Upon inspection it is apparent that the project would not increase downstream flows to the lower Truckee River.

c. SPF General Rain Event. - During the SPF all previously mentioned floodflows behind project features would contribute to this reach in addition to the floodflows mentioned above. Floodflows south of the river would drain into the Steamboat Marsh area by interior flood control features to be described later. Floodflows north of the river in the Sparks industrial area would drain as stated in Reach 5. As shown on Figure 29, the project would not induce additional flooding during an SPF event in the project area. Also Figure 29 shows that the SPF project floodflows exceed preproject only during the recession period of the event.

7. Probable Maximum Flood (PMF) Event.

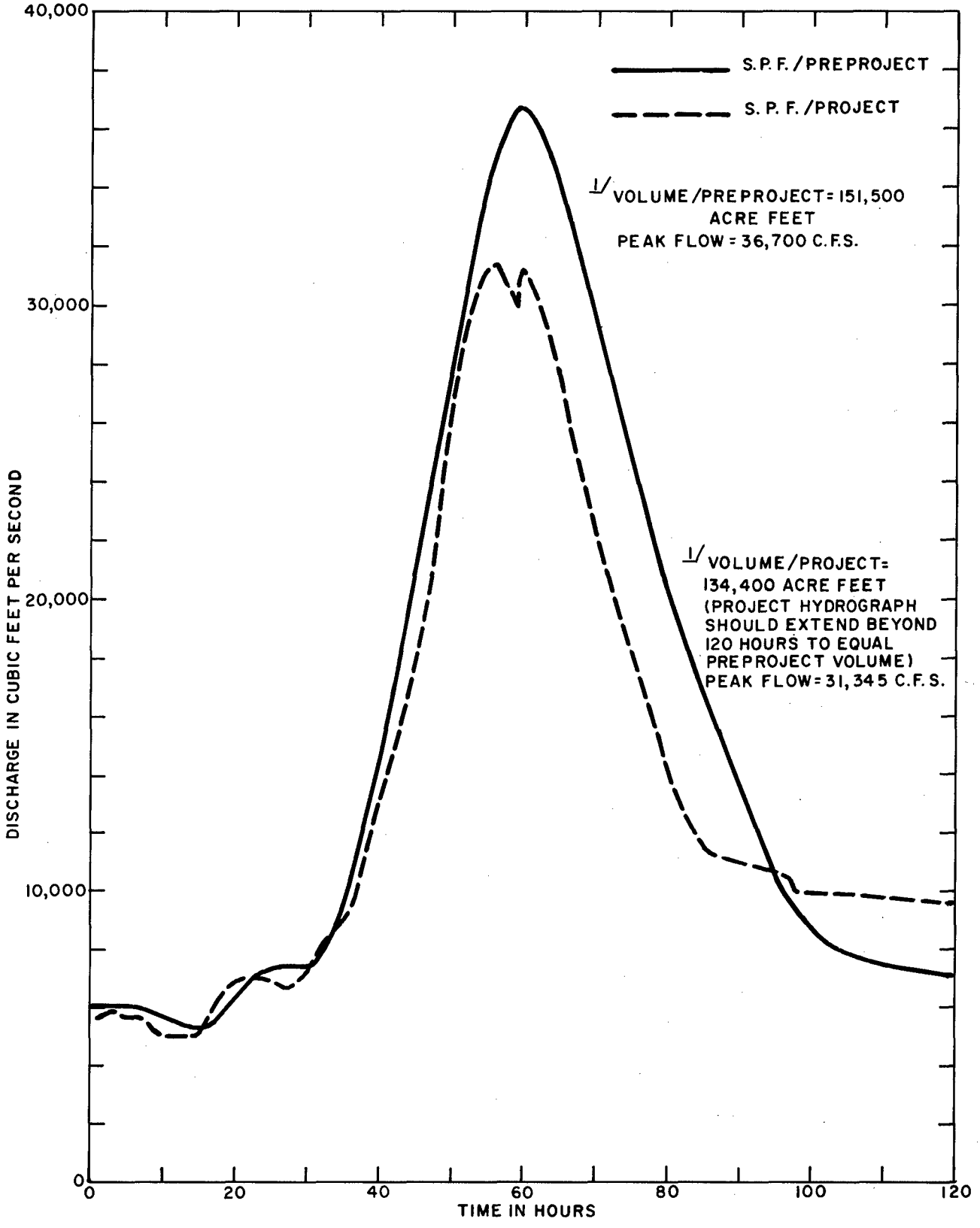
The PMF represents the most severe event reasonably possible for the region. A flood of this magnitude, which typically represents twice the volume of a SPF, would inundate a significant portion of the project area to depths exceeding levee and floodwall heights. Floodflows in the area of the detention basin would rise above basin levees. It is anticipated that project condition flood plains would be the same as preproject flood plains.

8. Interior Flood Control Features. - Interior flood control features have been developed to ensure safe passage of interior runoff during project operation. The following discussion will include a description of the proposed features and the operation during the general rain design event. These features are listed on Table 33 and displayed on Figure 30.

a. North and South Reno Area. - Fourteen 48" culverts with flapgates will be placed through the floodwalls in the North Reno area in order to accommodate SPF cloudburst conditions. All existing storm drains will be extended through project floodwalls to maintain drainage. It is recommended that flapgates be installed on all existing culverts to prevent backwater during events exceeding project design flows.

b. McCarran Area. -

Three 36-inch culverts with flapgates will be placed through the south bank levee just west of McCarran Boulevard. This will allow drainage of this area to the Truckee River. During the 100-year design event, culvert flapgates will be closed due to high stages within the Truckee River and some minor nuisance flooding (average depth less than 0.5 feet) will occur north of Mill Street. However, this flooding will be far less extensive than under preproject conditions. Two 42-inch culverts with flapgates are proposed to extend through the west levee of the detention basin. These culverts will allow both North and South Pioneer ditches to drain local runoff during the SPF cloudburst storm event when floodflows are not in the detention basin. During the summer months these culverts will also convey irrigation water to the agricultural area within the detention basin. During the general rain design storm, ponding areas are formed along both North and South Pioneer ditches due to high stages within the detention basin. Features to eliminate this ponding consist of an open ditch (See Figure 30) to be constructed between South Pioneer Ditch and Boynton Slough. The ditch will run parallel to the west levee of the detention basin between McCarran Boulevard and the



1/ VOLUME REPRESENTS THAT VOLUME ACCUMULATED OVER A 5-DAY (120 HR.) PERIOD.

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

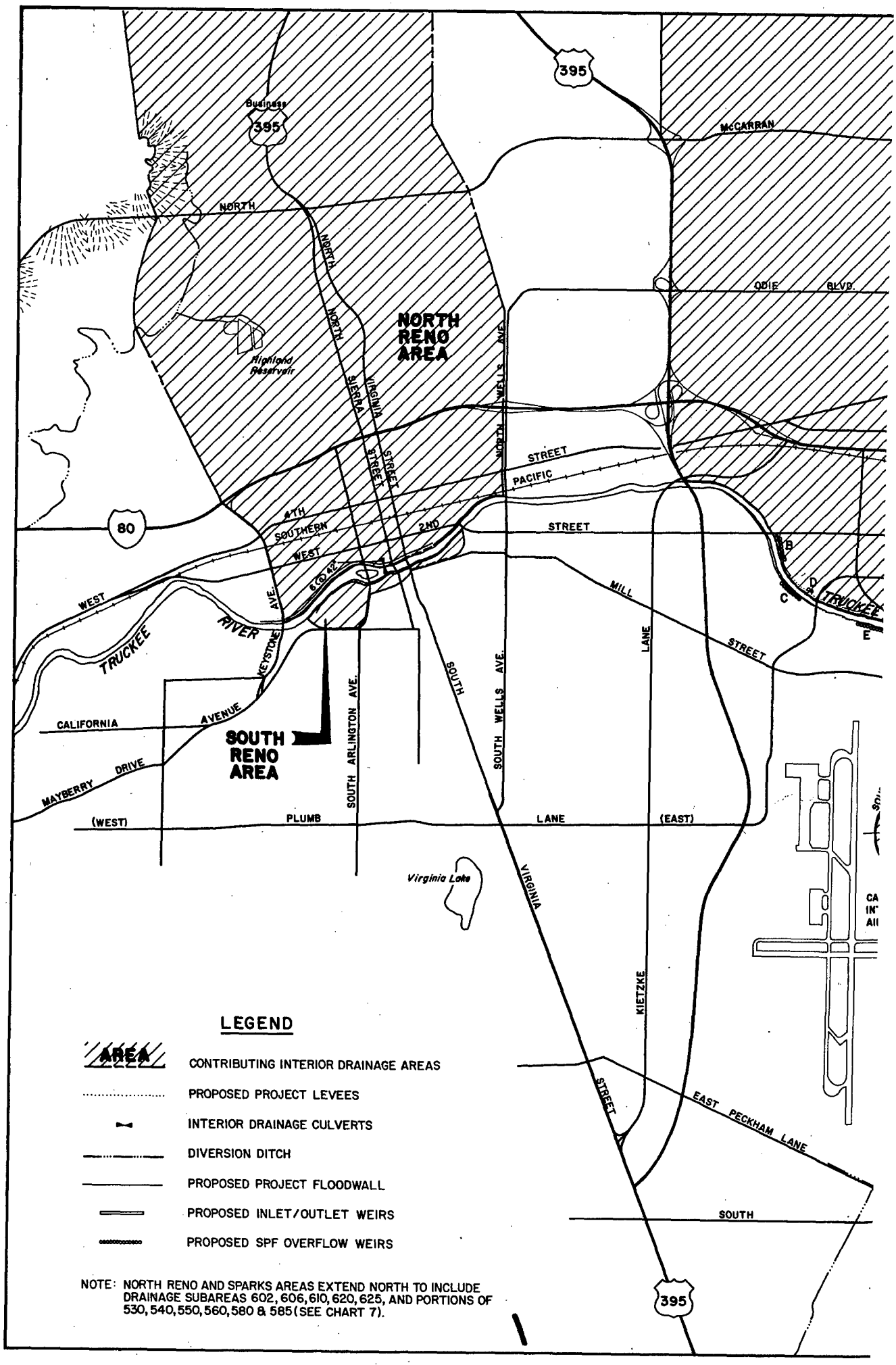
TOTAL FLOW AT VISTA UNDER SPF CONDITIONS

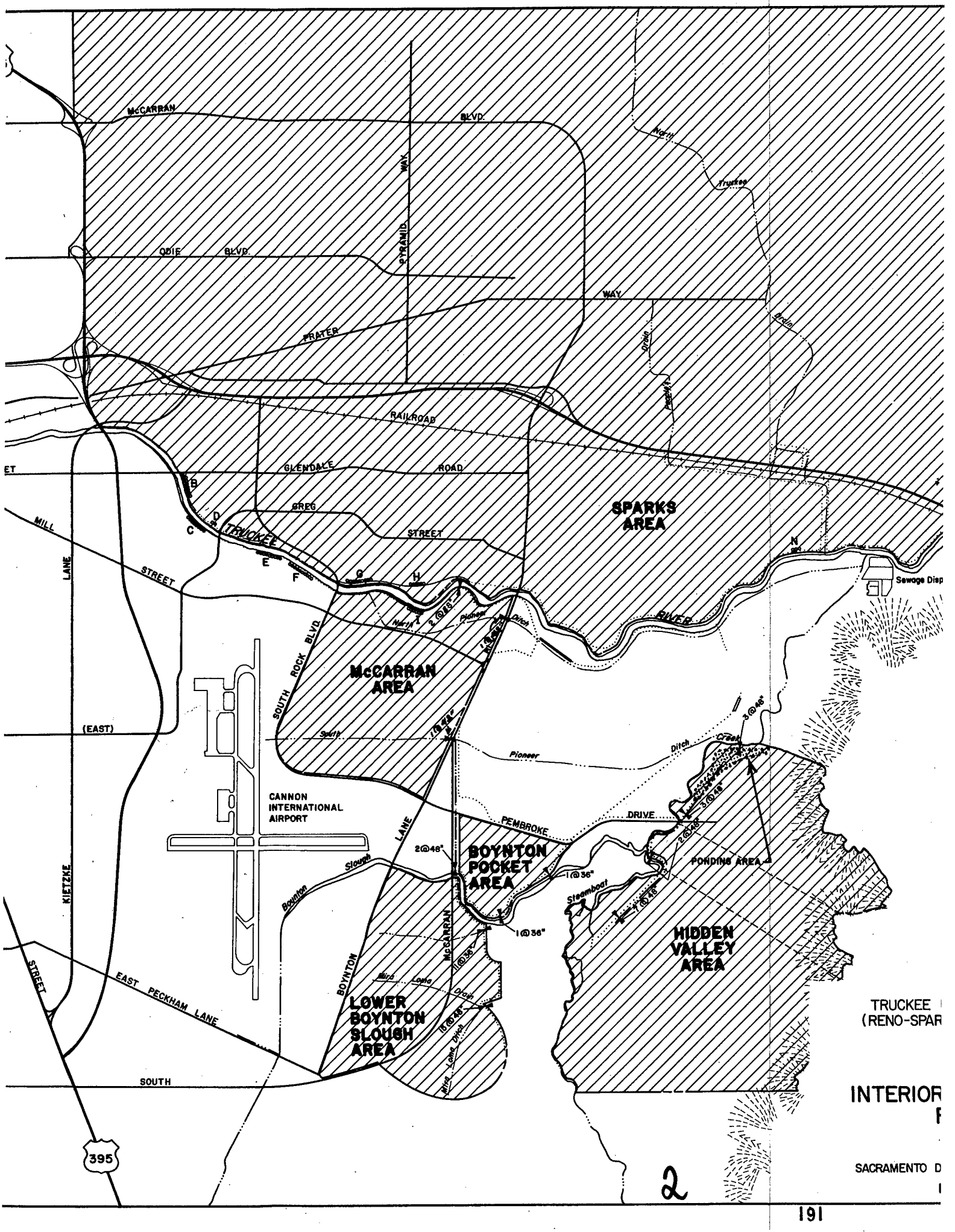
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

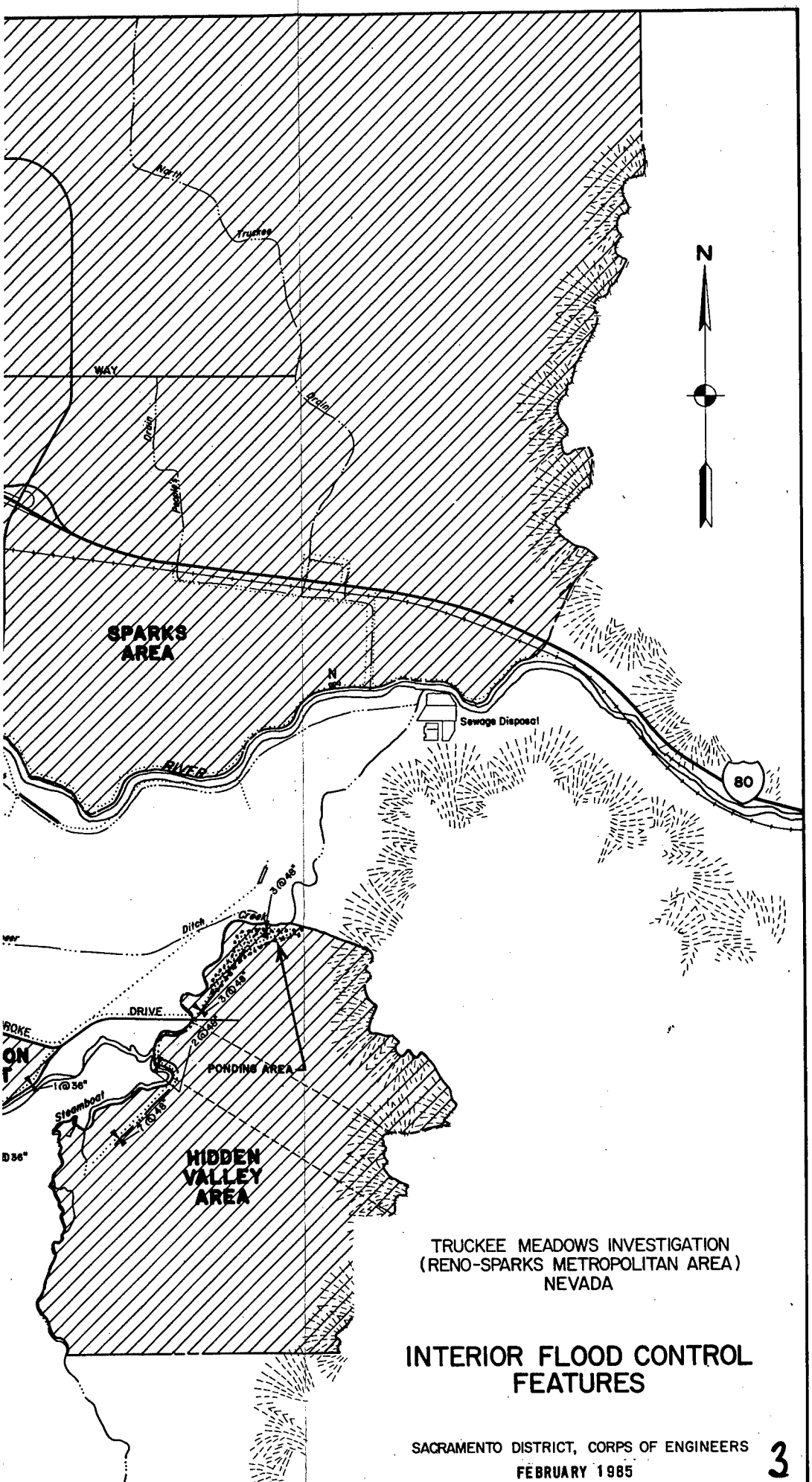
FIGURE 29

TABLE 33
INTERIOR FLOOD CONTROL FEATURES

Interior Drainage Area	Proposed Feature	Location
North Reno	Extend existing interior drainage culverts through floodwalls 14 - 48" Culverts with flapgates	Truckee River outfall
South Reno	Extend existing interior drainage culverts through floodwalls	Truckee River outfall
McCarran	3 - 48" Culverts with flapgates through levee 2 - 42" Culverts with flapgates through detention basin levee 2 - 48" Culverts with flapgates through Boynton Slough levee Trapezoidal diversion ditch Cross sectioned area = 65 SQ feet Ditch length = 3,600 feet Existing North and South Pioneer ditches	Truckee River outfall North and South Pioneer Ditches Boynton Slough Outfall See Figure 30
Boynton Pocket	3 - 36" Culverts with flapgates through Boynton Slough levee	See Figure 30
Lower Boynton Slough	11 - 36" Culverts with flapgates through levee 15 - 48" Culverts with flapgates through levee Existing Mira Loma Drain and Mira Loma Ditch	See Figure 30
Hidden Valley	16 - 48" Culverts with flapgates through levee 4 - 48" Culverts with flapgates through levee 20 - 48" Culverts with flapgates through levee Trapezoidal drainage ditch Cross sectional area = 24 SQ feet Ditch length = 5,000 feet	North Subarea of Hidden Valley Central Subarea of Hidden Valley South Subarea of Hidden Valley See Figure 30
Sparks	Extend existing interior drainage culverts through floodwalls and levees Existing North Truckee Drain and People's Drain	Truckee River Outfall


NORTH RENO AREA
SOUTH RENO AREA
Business 395
395
McCARRAN
NORTH
NORTH VIRGINIA STREET
NORTH SIERRA STREET
NORTH WELLS AVE.
ODIE BLVD.
Highland Reservoir
STREET
PACIFIC
4TH
SOUTHERN
2ND
STREET
80
WEST
6TH
WEST
TRUCKEE RIVER
KEYSTONE AVE.
MILL
STREET
TRUCKEE
B
C
D
E
CALIFORNIA
AVENUE
MAYBERRY DRIVE
SOUTH ARLINGTON AVE.
SOUTH WELLS AVE.
LANE
(WEST)
PLUMB
LANE
(EAST)
Virginia Lake
VIRGINIA
KIETZKE
STREET
EAST PECKHAM LANE
SOUTH
395
LEGEND
AREA
CONTRIBUTING INTERIOR DRAINAGE AREAS
PROPOSED PROJECT LEVEES
INTERIOR DRAINAGE CULVERTS
DIVERSION DITCH
PROPOSED PROJECT FLOODWALL
PROPOSED INLET/OUTLET WEIRS
PROPOSED SPF OVERFLOW WEIRS
NOTE: NORTH RENO AND SPARKS AREAS EXTEND NORTH TO INCLUDE DRAINAGE SUBAREAS 602, 606, 610, 620, 625, AND PORTIONS OF 530, 540, 550, 560, 580 & 585 (SEE CHART 7).


McCARRAN BLVD.
PYRAMID WAY
ODIE BLVD.
WAY
PRATER
RAILROAD
GLENDALE ROAD
GREG STREET
TRUCKEE
MILL STREET
LANE
SPARKS AREA
McCARRAN AREA
SOUTH ROCK BLVD.
(EAST)
CANNON INTERNATIONAL AIRPORT
KIETZKE
STREET
EAST PECKHAM LANE
SOUTH
395
BOYNTON POCKET AREA
LOWER BOYNTON SLOUGH AREA
HIDDEN VALLEY AREA
PONDING AREA
PEMBROKE DRIVE
Steamboat
Boynton Slough
Pioneer Ditch
North Truckee Drain
Sewage Disp
RIVER
TRUCKEE
(RENO-SPAR
INTERIOR
SACRAMENTO D



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

INTERIOR FLOOD CONTROL FEATURES

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

3

FIGURE 30

project levee, continuing south along McCarran to Boynton Slough. At the discharge point at Boynton Slough, two 48-inch culverts with flapgates will be extended through the levee. These features will provide the necessary storage for the ponding volume when the storage in Boynton Slough is high and the flapgates are closed during the general rain design storm. It will also allow faster drainage of the local area when the flapgates are open.

c. Boynton Pocket Area

Three 36-inch culverts with flapgates will be placed along the Boynton Slough backwater levee. This will allow safe passage of local runoff during the SPF cloudburst event. During the general rain design storm, local runoff for the Boynton area is minimal and therefore only nuisance flooding (less than 0.5 feet) of streets and gutters will occur.

d. Lower Boynton Slough Area

Fifteen 48-inch culverts with flapgates will be placed along the setback levee at Mira Loma Drain. Eleven 36-inch culverts with flapgates will be placed near South McCarran Boulevard at the open ditch which drains northeast at McCarran and Boynton Slough. These culverts are required to maintain the existing drainage capacity of two drainage ditches. For the SPF cloudburst storm local runoff will drain to Boynton Slough via the existing drainage ditches and through the culverts with no ponding. During the general rain design storm when stages in Steamboat Creek force closure of the flapgates, interior runoff will be stored in the Mira Loma Drainage channel and will cause some minimal nuisance flooding along McCarran Boulevard.

e. Hidden Valley Area

For analysis and design purposes, the Hidden Valley area was divided into three drainage areas. For the northern area, sixteen 48-inch culverts with flapgates will be extended through project levees. The southern area requires twenty 48-inch culverts with flapgates. The center area requires four 48-inch culverts with flapgates. These culverts will provide interior drainage during a specific localized storm. During the general rain design storm, ponding areas develop as a result of high stages within the Steamboat overflow area. Features to eliminate this ponding consist of an open drainage ditch aligned parallel with the Hidden Valley levee system to carry storm runoff to the northern area. The northern area is currently undeveloped rangeland and would provide temporary storage for interior runoff. Flowage easements will be acquired on 20 acres in the northern area for temporary ponding.

f. Sparks

All existing storm drain culverts will be extended through project floodwalls and/or levees to maintain drainage. All storm drain outlets will include flapgates. During the general rain design storm only nuisance flooding to streets and gutter systems is expected to occur in the Sparks industrial area. No significant damage is expected.

F. RISK AND UNCERTAINTY

Whether the selected plan will operate in the manner described and provide benefits as stated is dependent on the various assumptions, data base, and analytic techniques used in the study. The data used for forecasted economic, demographic, and environmental conditions are at this time the most reliable assessment of the future. There is little risk that changes in this data will have an impact on project accomplishments.

With regard to flood control accomplishments, a degree of uncertainty would exist on the level of protection provided, stemming from the uncertainty inherent in the hydrologic analysis. In view of the extensive hydrologic analysis conducted during this study and the operation of the project, it is believed that any uncertainty is small. The project is essentially a levee/channel plan which has been designed to permit floodwaters in excess of design capacity to escape the river safely at predetermined locations. The areas flooded from these excess flows would be the same as areas flooded without the project. Flooding would occur gradually with advance warning. These design features will preclude sudden levee failure and the potential for a catastrophic condition. Because of these features the risks resulting from any uncertainty in the hydrologic analysis are very small.

G. DESIGN AND CONSTRUCTION CONSIDERATIONS

Levees and floodwalls were set back and the alignment determined by considering the location of significant features such as landscaping, natural vegetation, recreation paths, buildings, picnic areas and adjacent land-use. Floodwalls are located in some areas where construction of levees would be impracticable because of limited available land area or costly facility replacement. Channel excavation was limited to that which was absolutely necessary in order to pass the design flows.

Proposed levees have a crown width of 12 feet and sideslopes of 1V to 3H waterside and 1V to 2H landside. Maximum levee height is about 15 feet with a patrol road constructed on the levee crown. Levee settlement during and after construction will be negligible and seepage is expected to be minimal.

Based on laboratory testing to date, the existing foundation in the lower Truckee and Steamboat area is suitable for levee construction. The selected levee section will be designed based on foundation and borrow material secondary laboratory test results (i.e. shear strength, consolidation, compaction and permeability tests) to be completed in later design phases of the project.

Reinforced concrete floodwalls are of two different types. One type is an inverted T, constructed on a setback or existing bank, varying in height from 0 to 8 feet above ground. The other floodwall is a poured-in-place vertical wall with a 5-foot-deep sheet cut-off extending below the wall. This floodwall will be constructed and anchored to existing floodwalls in downtown Reno. Rock and wire gabion baskets will also be laced and stacked to form a wall.

There are three rubble-mound diversion dams in the study reach. The North Truckee Diversion Dam near Glendale Boulevard is to be removed, a

replacement constructed upstream, and a supply ditch rerouted to the new dam. This realignment and use of more efficient materials in the new diversion dam will reduce the roughness coefficient of the channel in this area resulting in increased flowage through the area and will provide a more stable structure. The Pioneer Ditch and the Glendale Ditch Diversion Dams further downstream will both remain in their existing conditions.

A layer of rock 15 inches thick will be placed on the exposed slopes of all excavated channels on the Truckee River. This is necessary because of high flow velocities. Rock protection will also be placed at bridge abutments and side slopes.

The average construction season of this type of project will probably begin in April and end during the first half of November with no construction during the winter season. The estimated total construction time is 6 years. All of the basic material necessary for construction of the project such as sand, cement, soil embankment, and rock are available within 10 miles of the construction area.

H. OPERATION AND MAINTENANCE

The operation and maintenance costs represent the average cost to maintain the project improvements throughout the project life. The maintenance costs for flood control features (levees, channels, flood control structures) and recreation and fish and wildlife improvements would be accomplished in accordance with provisions of Title 33, Flood Control Regulation, Maintenance and Operation of Flood Control Work approved by Secretary of Army, 9 August 1944, published 17 August 1944 Federal Register. The general intent of the regulations is as follows "...the structures and facilities constructd by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits."

Annual operation and maintenance and replacement costs associated with the flood control plan would average $163,000 for the detention basin features, levees, and rock revetment, over the 50-year project life. Annual recreation operation and maintenance costs would average $127,000 and those of fish and wildlife would average $60,000. All operation and maintenance costs are based on known expenditures for similar projects.

I. RIGHTS-OF-WAY

Rights-of-way would be required for all flood control, recreation and fish and wildlife improvements. Costs for rights-of-way include project lands and any associated damages during construction. For flood control improvements rights-of-way will be required for levee and floodwall construction which includes a permanent access easement 15 feet wide located adjacent to the landward side of the levee/floodwall site. Also rights-of-way will be required for the area between the levee or floodwall rights-of-way and the river. The cost of the rights-of-way along the Truckee River are estimated at fee value because of the limitations placed on land use. These areas are floodways and as such no improvements, excavation, or landfilling is permitted. The cost of the rights-of-way has been reduced by the value of lands already provided under the Truckee River and Tributaries project.

Under this project, local interests provided lands for a channel capacity of 14,000 cfs through downtown Reno and 6,000 cfs through the Truckee Meadows. Therefore, the rights-of-way costs include only those lands applicable to the increase in design flow from 14,000 or 6,000, depending on the location along the Truckee River, to 18,500 cfs.

Rights-of-way will also be required for flood storage capacity and periodic flooding for lands within the detention basin and Steamboat Creek overflow area. Both of these areas are currently used for agricultural purposes and the potential for industrial or residential development would be limited due to the poor water quality, high water table and the added foundation requirements for development. Given the limitations and restrictions imposed by the rights-of-way, the cost has been estimated to be 50 percent of fee value within the detention basin and 25 percent of fee along the Steamboat Creek area.

For recreation improvements additional off-project lands of approximately 5.7 acres would be acquired to provide access to project features. A permanent environmental easement would be acquired for fish and wildlife enhancement lands to which public access would be limited. This would include the 300 acre Steamboat Marsh Nature area and approximately 10 acres along Steamboat Creek north of Pembroke Lane. Also additional rights will be required on 15 acres located along lower Steamboat Creek and along the south bank of Truckee River near the confluence of Steamboat Creek for mitigation purposes. Table 34 summarizes the rights-of-way requirements for the project.

J. RELOCATIONS

Facilities to be relocated for project improvements are identified in Table 35. No relocations are required for the recreation plan.

K. CONSTRUCTION SCHEDULE

The construction of the project, as recommended, would require approximately 6 years to complete. Levee channel and floodwall work could be completed in approximately 3 years. Replacement of the six bridges in downtown Reno will require 6 full years because of the heavy traffic uses of these bridges and the required stage construction (one improvement per year).

Phase I: The levees and floodwalls on both sides of the Truckee River between U.S. 395 and McCarran Boulevard, as well as the improvement of a bridge in Reno, will be completed during the first construction season.

Phase II: During the second construction season, the levees north of the river between McCarran Boulevard and the downstream end of the project, and the levees in the lower Boynton Slough area will be completed. Another bridge in Reno will also be improved.

Phase III: During the third construction season, the remaining levees and floodwalls, the Pembroke Bridge causeway, and one bridge in Reno will be completed. The remaining levees and floodwalls are those of the detention basin, boynton pocket, downtown Reno, and Hidden Valley areas. In the fourth, fifth, and sixth years, one bridge in Reno per year will be improved.

L. ECONOMICS OF THE SELECTED PLAN

Estimated first cost of the flood control features are listed in Table 36A. The total first cost for the flood control features including mitigation is $70,200,000. Estimated first cost of the recreation, fish and wildlife enhancement, and fish and wildlife mitigation features are shown in Table 36B. The estimated recreation first cost is $4,520,000. Fish and wildlife enhancement features of the project have an estimated first cost of $4,140,000. Operation and maintenance cost of these enhancement features is estimated at $60,000. Estimated first cost for fish and wildlife and cultural mitigation features is $700,000 and $400,000, respectively. A detailed listing of project features is shown on Table 37.

The economics of all features of the plan are shown in Table 38. The benefit-cost ratio for the flood control portion is 1.6 to 1. Under 1982 conditions, the benefit-cost ratio would be .7 to 1. This ratio would in crease to 1.0 to 1 under 1985 conditions.

Interest during construction is not applicable and was not included in the project cost estimates. Project benefits will accrue during the first and subsequent years of construction as portions of the project are completed. (See Section K construction schedule.)

During the first construction season, benefits will begin to accumulate. Construction of the levees and/or floodwalls on both sides of the river, between U.S. 395 and McCarran Boulevard, will increase the level of protection to the McCarran and southwest Sparks areas.

The second construction season benefits are derived as follows. The completion of Phase II project levees will provide 100-year protection to the Sparks and Lower Boynton Slough areas.

The third construction season benefits result from completion of all remaining levees and floodwalls plus the improvement of the Pembroke Bridge. This yields 100-year flood protection for the Boynton Pocket and Hidden Valley areas.

Replacement of the six bridges in downtown Reno will occur at the rate of one per year. Benefits will increase each year, since the bridge causing the most severe constrictions in the Truckee River will be improved to sequentially reduce obstructions to the flow. This incrementally reduces flood damage potential in the downtown Reno area until 100-year protection is provided in the sixth construction year.

M. INCREMENTAL JUSTIFICATION

An economic analysis of project increments was conducted to verify that each component of the selected plan was justified. The increments consisted of downtown Reno to U.S. 395 and from U.S. 395 to Vista. Benefits associated with flood reduction to damage reaches 1, 2, 2A, 2B, 2C, 8 and 9 are attributed to the downtown Reno increment. Flood reduction to reaches 3, 4, 5, 6, 7, 8A, 8, 9, 10, and 11 are associated with the U.S. 395 to Vista increment. In reaches 8 and 9 both increments provide flood reduction benefits due to the source of floodflows contributing to each reach.

Floodflows breaking out of the Truckee River in downtown Reno will flow under US 395 into reaches 8 and 9. Floodflows breaking away to the south from the Truckee River east of US 395 highway will also enter reaches 8 and 9. These floodflow breakouts produce flood damages to reaches 8 and 9. Approximately 70 percent of the total floodflows is attributable to the downtown Reno breakout and the remaining 30 percent is from the breakout east of US 395. Benefits attributed to each increment were apportioned based on those percentages. An economic summary of costs and benefits is shown on Table 38A. This data indicates that each increment is separately justified.

TABLE 34
PROJECT RIGHT-OF-WAY REQUIREMENTS
SELECTED PLAN
(1 OCTOBER 1984 PRICES; 8-3/8 PERCENT DISCOUNT)

	FLOOD CONTROL									RECREATION	FISH/WILDLIFE	
	PERMANENT EASEMENTS			FLOWAGE EASEMENT	IMPROVEMENTS							
REACH	RESI-DENTIAL	COMMERCIAL/ INDUSTRIAL	AGRI-CULTURAL	AGRICULTURAL	RESI-DENTIAL	PUBLIC PARKS	RELO-CATIONS	ACQUI-SITION	FLOOD CONTROL TOTAL	PERMANENT EASEMENTS COMMERCIAL	PERMANENT EASEMENTS AGRICULTURAL	TOTAL
Upstream Limit to Booth St.												
Booth St. to Arlington Ave.	.2 acres $ 20,000							2 owners $ 8,000	$ 28,000			$ 28,000
Arlington Ave to Sierra St.												
Sierra St. to Lake St.		.2 acres $ 581,000					$ 25,000	15 owners $ 60,000	$ 666,000	.33 acres $ 50,000		$ 716,000
Kietzke Ln to Glen-dale Ave.		5 acres $ 1,400,000						5 owners $ 20,000	$ 1,420,000			$ 1,420,000
Glendale Ave. to Greg St.		4.3 acres $ 986,000						3 owners $ 12,000	$ 998,000			$ 998,000
Greg St. to So. Rock Blvd.		7.4 acres $ 1,700,000						6 owners $ 24,000	$ 1,724,000			$ 1,724,000
So. Rock Blvd. to McCarran Blvd.		21 acres $ 3,500,000			$ 95,000	$ 65,000	$ 30,000	8 owners $ 32,000	$ 3,722,000	5.37 acres $920,000		$ 4,642,000
McCarran Blvd. to Vista		18.1 acres $ 2,332,000				$124,000		9 owners $ 36,000	$ 2,492,000			$ 2,492,000
University Farms Overflow			45.6 acres $ 800,000	818 acres $ 7,200,000	$214,000		$110,000	20 owners $ 80,000	$ 8,404,000			$ 8,404,000
Steamboat Creek			40.5 acres $ 648,000	797.9 acres $ 4,440,000				5 owners $ 20,000	$ 5,108,000		309.5 acres $3,200,000 (Enhancement) 15 acres $ 140,000 (Mitigation)	$ 8,448,000
Boynton Slough	5.5 acres $150,000 5.7acres	56 acres	86.1 acres	1615.9 acres				22 owners $ 88,000	$ 238,000	5.7 acres	324.5acres	$ 238,000
TOTAL	$170,000	$10,499,000	$1,448,000	$11,640,000	$309,000	$189,000	$165,000	$380,000	$24,800,000	$970,000	$3,340,000	$29,110,000

TABLE 35
SUMMARY OF RELOCATION REQUIREMENTS
SELECTED PLAN
(1 OCTOBER 1984 PRICES)

REACH	Roads	Bridges	Diversions	Service (Gas, Water, Sewage & Power)	Irrigation Ditch	Telephone	TOTAL
Upstream Limit to Booth St.		$ 666,000		$ 94,000			$ 760,000
Booth St. to Arlington Ave		$ 1,650,000		$269,000			$ 1,919,000
Arlington Ave. to Sierra St.		$ 1,236,000					$ 1,236,000
Sierra St. to Lake St.		$ 4,500,000		$338,000		$2,603,000	$ 7,441,000
Kietzke Ln. to Glendale Ave.			$ 420,000				$ 420,000
Glendale Ave. to Greg St.							
Greg St. to So. Rock Blvd							
So. Rock Blvd. to McCarran Blvd							
McCarran Blvd. to Vista							
University Farms Overflow							
Steamboat Creek	$72,000	$ 3,456,000			$ 47,000		$ 3,575,000
Boynton Slough				$ 49,000			$ 49,000
TOTAL	$72,000	$11,508,000	$420,000	$750,000	$ 47,000	$2,603,000	$15,400,000

TABLE 36A
SUMMARY OF PROJECT FIRST COST FOR FLOOD CONTROL IMPROVEMENTS
SELECTED PLAN
(1 OCTOBER 1984 PRICES; 8-3/8 PERCENT DISCOUNT)

REACH	FLOOD CONTROL										
	LEVEES	CHANNELS	FLOODWALLS	LANDS & DAMAGES	DIVERSION STRUCTURES	RELOCATIONS	UTILITIES	MITIGATION 1/	ENGINEERING AND DESIGN	SUPERV & ADMIN	TOTAL
Upstream Limit to Booth Street						$ 666,000	$ 94,000		$ 90,000	$ 60,000	$ 910,000
Booth Street to Arlington Avenue		$ 31,000	$ 449,000	$ 28,000		$ 1,650,000	$ 269,000	$ 68,000F $ 30,000C	$ 295,000	$ 201,000	$ 3,021,000
Arlington Avenue to Sierra Street		$185,000	$ 674,000			$ 1,236,000		0 $ 10,000C	$ 250,000	$ 170,000	$ 2,525,000
Sierra Street to Lake Street			$1,723,000	$ 666,000		$ 4,500,000	$2,941,000	0 $ 50,000C	$1,100,000	$ 745,000	$11,725,000
Kietzke to Glendale Avenue			$ 449,000	$ 1,420,000		$ 420,000		$ 19,000F	$ 115,000	$ 80,000	$ 2,503,000
Glendale Avenue to Greg Street	$ 174,000		$ 824,000	$ 998,000	$1,410,000			$ 30,000F	$ 280,000	$ 200,000	$ 3,916,000
Greg Street to South Rock Blvd.	$ 436,000		$ 150,000	$ 1,724,000	$ 492,000			$ 42,000F	$ 120,000	$ 83,000	$ 3,047,000
South Rock Blvd. to McCarran Blvd.	$ 261,000	$162,000	$3,221,000	$ 3,722,000	$1,017,000			$ 19,000F	$ 600,000	$ 385,000	$ 9,387,000
McCarran Blvd. to Vista	$1,829,000	$392,000		$ 2,492,000	$ 361,000			$ 70,000F	$ 395,000	$ 262,000	$ 5,801,000
University Farms Overflow	$3,049,000			$ 8,404,000	$1,320,000			$ 87,000F $100,000C	$ 440,000	$ 290,000	$13,690,000
Steamboat Creek	$1,829,000			$ 5,108,000		$ 3,528,000	$ 47,000	$365,000F $210,000C	$ 605,000	$ 395,000	$12,087,000
Boynton Slough	$1,132,000			$ 238,000			$ 49,000	0	$ 110,000	$ 59,000	$ 1,588,000
TOTAL	$8,710,000	$770,000	$7,490,000	$24,800,000	$4,600,000	$12,000,000	$3,400,000	$1,100,000	$4,400,000	$2,930,000	$70,200,000

1/ F and C refer to fish and wildlife and cultural mitigation, respectively.

TABLE 36B
SUMMARY OF PROJECT FIRST COSTS FOR RECREATION AND
FISH AND WILDLIFE ENHANCEMENT
(1 OCTOBER 1984 PRICES; 8-3/8 PERCENT DISCOUNT)

REACH	NAME	RECREATION					FISH AND WILDLIFE ENHANCEMENT				
		FACILITY	LANDS AND DAMAGES	ENGINEERING AND DESIGN	SUPERVISION AND ADMINISTRATION	TOTAL	FACILITY COSTS	LANDS AND DAMAGES	ENGINEERING AND DESIGN	SUPERVISION AND ADMINISTRATION	TOTAL
Upstream Limit to Booth St.		$					Groupings $ 66,000		$ 8,000	$ 5,000	$ 79,000
Booth St. to Arlington Ave.	Riverside Park	$ 90,000		$ 11,000	$ 7,000	$ 108,000					
Arlington Ave. to Sierra St.	Riverwalk	$ 340,000		$ 42,000	$ 30,000	$ 412,000					
Sierra St. to Lake St.	Downtown Redevelop-ment Area		.33 Acre $ 50,000			$ 50,000					
Kietzke Ln. to Glendale Ave.											
Glendale Ave. to Greg St.											
Greg St. to So Rock Blvd.	Greg St. Park	$ 235,000		$ 30,000	$ 12,000	$ 277,000					
	Mill St. Park	$ 370,000		$ 45,000	$ 32,000	$ 477,000					
So Rock Blvd. to McCarran Blvd.	River Bend Access	$ 117,000	5.4 Acre $ 920,000	$ 15,000	$ 10,000	$1,062,000					
McCarran Blvd. to Vista	Franklin Park	$ 168,000		$ 20,000	$ 13,000	$ 201,000					
	Kimlick Park	$ 507,000		$ 62,000	$ 44,000	$ 613,000					
University Farms Overflow	Basin River Access	$ 228,000		$ 27,000	$ 18,000	$ 273,000					
Steamboat Creek	Pembroke Park	$ 408,000		$ 50,000	$ 35,000	$ 493,000	9.5 Acres Riparian Planting $127,000 300 Acre Marsh $587,000	$3,200,000	$ 92,000	$55,000	$4,061,000
Boynton Slough	Pedestrian/ Bike Path	$ 487,000		$ 58,000	$ 39,000	$ 584,000					
TOTAL		$4,450,000	$ 970,000	$360,000	$240,000	$4,520,000	$780,000	$3,200,000	$100,000	$60,000	$4,140,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Flood Control Improvements				
Levees				
Clearing and Grubbing	1	LS	75,000.00	75,000
Embankment	878,000	CY	3.75	3,292,500
Excavation (Inspection Trench)	168,000	CY	1.70	285,600
Excavation (Waste)	85,000	CY	1.10	93,500
Aggregate - Patrol Road	24,000	TON	10.70	256,800
Fencing	53,300	LF	9.65	514,345
Seeding	101	AC	430.00	43,430
Water (Compaction & Dust)	56,300	MG	6.45	363,135
Excavation	78,800	CY	1.75	137,900
Rock	50,100	TON	16.10	806,610
Grout	810	CY	110.00	89,100
Care & Diversion of Water	1	LS	27,500.00	27,500
Culverts & Flapgates	1	LS	740,000.00	740,000
Diversion Ditch	1	LS	50,000.00	50,000
Care of Traffic	1	LS	45,000.00	45,000
Gabions	4,400	CY	100.00	440,000
Subtotals				7,260,420
Contingencies ± 20%				1,449,580
Total Levees				8,710,000
Floodwalls				
Clearing & Grubbing	1	LS	2,500.00	2,500
Excavation	14,800	CY	8.60	127,280
Formed Concrete	18,800	CY	195.00	3,666,000
Cement	87,800	CWT	4.80	421,440
Reinforcing Steel	755,000	LBS	0.50	377,500
Sheet Piling	15,600	SF	16.10	251,160
Soil Anchors	1	LS	975,000.00	975,000
Rock	3,080	TON	16.25	50,050
Grout	315	CY	110.00	34,650
Fencing	2,800	LF	9.65	27,020
Seeding	5	AC	425.00	2,125
Care of Traffic	1	LS	110,000.00	110,000
Care & Diversion of Water	1	LS	200,000.00	200,000
Subtotals				6,244,725
Contingencies ± 20%				1,245,275
Total Floodwalls				7,490,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Flood Control Improvements (Continued)				
Channels				
Clearing and Grubbing	1	LS	3,200.00	3,200
Excavation	70,600	CY	3.55	250,630
Rock	12,500	TON	16.00	200,000
Seeding	2	AC	430.00	860
Care & Diversion of Water	1	LS	185,000.00	185,000
Subtotals				639,690
Contingencies ± 20%				130,310
Total Channels				770,000
Diversion Structures				
Upper Weir	1	LS	690,000.00	690,000
Lower Weir	1	LS	300,000.00	300,000
Lower Level Outlet	1	LS	110,000.00	110,000
SPF Overflow Weirs	1	LS	2,730,000.00	2,730,000
Subtotals				3,830,000
Contingencies ± 20%				770,000
Total Diversion Structures				4,600,000
Engineering and Design				
Channel				92,000
Levee				1,058,000
Floodwall				898,000
Diversion Structures				552,000
Total Engineering & Design				2,600,000
Supervision & Administration				
Channels				62,000
Levee				701,000
Floodwall				599,000
Diversion Structures				368,000
Total Supervision & Administraton				1,730,000
Total Flood Control Improvements				25,900,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Fish and Wildlife Mitigation Improvements				
Fish Ladders (three stepped pools, 18" ea step each step 2' x 4') [concrete construction]	2	EA	22,500.00	45,000
Riparian Vegetation (Planting) (Planting	31.4	AC	11,000.00	345,000
Subtotal				390,000
Contingencies ± 20%				80,000
Total				470,000
Engineering Design				55,000
Supervision & Administration				35,000
Subtotal F&W Mitigation				560,000
Fee Title of 15 acres of agricultural lands for mitigation purpose [50% of fee (flowage easement) already acquired for flood control purpose]				140,000
Total F&W Mitigation				$700.000
Cultural Resource Preservation				
Mitigational Documentation of Bridges	6	EA	12,500.00	75,000
Data Recovery Program (Pre-Historic)	1	LS	260,000.00	260,000
Subtotal				335,000
Contingencies ± 20%				65,000
Total Cultural Resource Preservation				400,000
Total Cost of Flood Control Facilities (including mitigation)				$27,000,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Land and Damages				
Fee Title				
Residential	5.7	AC	22,000.00	125,400
Commercial	54.9	AC	140,000.00	7,686,000
Agricultural	86.1	AC	12,300.00	1,059,030
Agricultural	309.5	AC	10,100.00	3,125,950
Industrial (Franklin Park Development for Converted LWCFA Land)	1	AC	95,000.00	95,000
Flowage Easements				
Agricultural	1,306.4	AC	6,000.00	7,838,400
Improvements - Parks	2.0	EA	70,000.00	140,000
Improvements - Structures	10.0	EA	23,000.00	230,000
Subtotals				20,299,780
Contingencies ± 35%				7,151,220
Subtotal Lands and Damages				27,451,000
Relocations - Structures	11	EA	15,000.00	165,000
Acquisitions - Ownerships	96	EA	4,000.00	384,000
Total Lands and Damages				28,000,000
				-3,200,000
				24,800,000 1/

1/ Fee Title of 309.5 AC of agricultural land includes land rights for both flood control and enhancement. Total fee (including Contingencies) equals $4,260,000 of which $3,200,000 is for enhancement and $1,060,000 for Flood Control.

Relocations				
Roads	1	LS	60,000.00	60,000
Bridges				
Booth Street	1	LS	550,000.00	550,000
Arlington Avenue	1	LS	1,320,000.00	1,320,000
Wingfield Park Ped.	1	LS	55,000.00	55,000
Lake Street	1	LS	1,250,000.00	1,250,000
Center Street	1	LS	1,320,000.00	1,320,000
Virginia Street	1	LS	1,180,000.00	1,180,000
Sierra Street	1	LS	1,030,000.00	1,030,000
Pembroke Drive	1	LS	2,880,000.00	2,880,000
Diversions (City of Sparks)	1	LS	350,000	350,000
Subtotals				9,995,000
Contingencies ± 20%				2,005,000
Total - Relocations				12,000,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Utilities				
Service - Gas, Water, Sewage, Power	1	LS	630,000.00	630,000
Irrigation Ditch	1	LS	40,000.00	40,000
Telephone	1	LS	2,170,000.00	2,170,000
Subtotals				2,840,000
Contingencies ± 20%				560,000
Total - Utilities				3,400,000
Engineering & Design				
Relocations				1,400,000
Utilities				400,000
Total - Engineering & Design				1,800,000
Supervision & Administration				
Relocations				950,000
Utilities				250,000
Total - Supervision & Administration				1,200,000
Total - Flood Control Lands, Relocations, Utilities, E&D, S&A				$43,200,000
Total - Flood Control Facilities (including Mitigation)				27,000,000
Total - First Cost Flood Control Improvements				$70,200,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Recreation Improvements				
Facilities				
Riverside Park:				
Parking Spaces	7	EA	1,300.00	9,100
Restroom - Four Stall	1	EA	65,900.00	65,900
Subtotal				75,000
Riverwalk (Downtown Reno)				
Picnic Sites	10	EA	2,200.00	22,000
River Overlooks	4	EA	27,250.00	109,000
Public Seating Area	1	EA	43,000.00	43,000
Landscaping	3	AC	32,500.00	97,500
Drinking Fountains	5	EA	2,200.00	11,000
Subtotal				282,500
Greg Street Park:				
Parking Spaces	49	EA	1,300.00	63,700
Restroom (Four Stall)	1	EA	65,100.00	65,100
Landscaping	2	AC	32,500.00	65,000
Drinking Fountain	1	EA	2,200.00	2,200
Subtotal				196,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Facilities				
Mill Street Park:				
Parking Spaces	55	EA	1,300.00	71,500
Picnic Sites	15	EA	2,300.00	34,500
Group Picnic Shelter	1	EA	19,000.00	19,000
Restroom (Four Stall)	1	EA	64,500.00	64,500
Pedestrian/Bike Bridge Over Truckee River	1	EA	80,000.00	80,000
Landscaping	1	AC	32,500.00	32,500
Drinking Fountain	3	EA	2,200.00	6,600
Subtotal				308,600
Riverbend Access:				
Parking Spaces	25	EA	1,300.00	32,500
Restroom (Four Stall)	1	EA	65,000.00	65,000
Subtotal				97,500
Kimlick Park				
Parking Spaces	50	EA	1,300.00	65,000
Picnic Sites	20	EA	2,200.00	44,000
Group Picnic Shelter	1	EA	80,000.00	80,000
Restroom (Four Stall)	1	EA	67,100.00	67,100
Landscaping	5	AC	32,500.00	162,500
Drinking Fountain	3	EA	1,300.00	3,900
Subtotal				422,500
Basin River Access:				
Parking Spaces	50	EA	1,300.00	65,000
Picnic Sites	20	EA	2,200.00	44,000
Group Picnic Shelter	1	EA	81,000.00	81,000
Subtotal				190,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Facilities				
Franklin Park:				
Parking Spaces	25	EA	1,300.00	32,500
Picnic Sites	5	EA	2,330.00	11,650
Restroom (Four Stall)	1	EA	65,000.00	65,000
Landscaping	0.8	AC	32,500.00	26,000
Drinking Fountain	2	EA	2,300.00	4,600
Subtotal				139,750
Pembroke Park:				
Parking Spaces	50	EA	1,300.00	65,000
Picnic Sites	10	EA	2,200.00	22,000
Restroom (Six Stall)	1	EA	85,000.00	85,000
Landscaping	5	AC	32,500.00	162,500
Drinking Fountain	2	EA	2,500.00	5,000
Subtotal				339,500
Bike/Pedestrian Paths:				
Asphalt Pathways (6 ft wide by 2 in. thick on 10 ft. wide by 4 in. thick compacted S.A.B.C. path)	15	MI	27,000.00	405,000
Subtotal				405,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Subtotals				2,456,350
Contingencies ± 20%				493,650
Total				2,950,000
Engineering & Design				360,000
Supervision & Administration				240,000
Total Recreation Facilities				3,550,000
Recreation Access Lands				
Fee Title				
Commercial Improvement	5.7	AC	125,000.00	712,500
Subtotals				712,500
Contingencies ± 35.0%				245,500
Subtotal Fee Title				958,000
Acquisitions - Ownerships	3	EA	4,000.00	12,000
				970,000
Total Recreation First Cost				$4,520,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Fish and Wildlife Enhancement Improvements				
Facilities				
1 Fish Habitat - Boulder Groups (Five Boulders per group, each 5' to 7' by 3' to 4' - some natural - some import from stone quarry @ 5 miles)	10.0	UNIT	5,500.00	55,000
2 Steamboat March Nature Area (Existing 55 Acre Marsh)				
Dike and Island Construction (Initial 40 AC open water - 3 ft deep, 120 AC emergent vegetation 1 foot of water)	1.0	LS	225,000.00	225,000
(@ 1,000 LF of 4 ft. height by 15 ft. wide levee dividing 160 AC into 4 compartments with 10 ft. wide gravel road. Add 15 ea 100 ft x 200 ft islands one ft. above open water surface)				
Observation/Interpretive Facilities (Parking Area - with 85 spaces picnic area - 15 sites tables 1 restroom - six stalls and @ 2,000 LF of boardwalk above the marsh)	1.0	LS	260,000.00	260,000
3 Streamboat Creek Riparian Planing (@ 35 Trees per acre)	10.0	AC	11,000.00	110,000
Subtotal				650,000
Contingencies ± 20%				130,000
Total				780,000
Engineering Design				100,000
Supervision & Administration				60,000
Total Facilities				940,000

TABLE 37
DETAILED ESTIMATE OF FIRST COST

Continued

Description	Estimated Quantity	Unit	Unit Cost	Total Cost
Fish and Wildlife Enhancement Improvements (Continued)				
Lands and Damages 300 acres Steamboat Marsh plus 9.5 acres riparian plantings Steamboat Creek				$3,200,000
Total Enhancement Improvements				$4,140,000

TABLE 38

ECONOMIC SUMMARY
SELECTED PLAN
(1 October 1984 Prices; 1990-2040 Project Conditions; 8-3/8% Discount Rate)

FIRST COST	
Flood Control*	$70,200,000
Fish and Wildlife Enhancement	$4,140,000
Recreation	$4,520,000
Total First Cost	$78,860,000
ANNUAL COST	
Flood Control**	
Interest and Amortization	$5,953,000
Operation and Maintenance***	$163,000
Subtotal	$6,116,000
Fish and Wildlife Enhancement	
Interest and Amortization	$353,000
Operation and Maintenance	$60,000
Subtotal	$413,000
Recreation	
Interest and Amortization	$385,000
Operation and Maintenance	$127,000
Subtotal	$512,000
TOTAL ANNUAL COST	$7,041,000
ANNUAL BENEFITS	
Flood Control	$9,717,000
Fish and Wildlife Enhancement	$1,153,000
Recreation	$2,395,000
TOTAL ANNUAL BENEFITS	$13,265,000
NET BENEFITS (Excess of Benefits/Costs)	$6,224,000
BENEFIT/COST RATIOS	
Flood Control	1.6:1
Fish and Wildlife Enhancement	2.8:1
Recreation	4.7:1
TOTAL PROJECT BENEFIT/COST RATIO	1.9:1

* Includes fish and wildlife and cultural resource mitigation costs of $700,000 and $400,000, respectively.
** Excludes $400,000 for cultural resource mitigation costs.
***Includes $2,500 in fish and wildlife mitigation operation and maintenance costs.

TABLE 38A

ECONOMIC SUMMARY OF INCREMENTAL ANALYSIS
(1 October 1984 Prices, 8-3/8 Percent Discount)

Increment	First Cost ($1,000)	Annual Costs* ($1,000)	Annual Benefits ($1,000)	Benefit-Cost Ratio
Downtown Reno	18,166	1,548**	1,575	1.02:1
US 395-Vista	52,034	4,568***	8,142	1.78:1
TOTAL	$70,200	$6,116	$9,717	

* Includes costs for operation and maintenance.
** Excludes $90,000 for cultural resources mitigation costs.
*** Excludes $310,000 for cultural resources mitigation costs.

CHAPTER VII
THE RECOMMENDED PLAN

The plan recommended for Federal implementation includes all features of the selected plan as described in Chapter VI with the exception of the fish and wildlife enhancement features. These enhancement features are not included in the recommended plan due to the lack of an enhancement sponsor. The enhancement sponsor would be responsible for cost sharing and administration of the enhancement features. Cost sharing with a non-Federal sponsor is 75 percent Federal and 25 percent non-Federal. If enhancement features support authorized Federal programs, as in this case the Migratory Bird Conservation Act and the Endangered Species Act, 100 percent of the first costs would be eligible as a Federal responsibility. The enhancement features of the plan would then be administered by the Federal agency supporting these programs. Since, at this time, no firm commitments for sponsorship have been received from either a Federal or non-Federal agency, enhancement features will not be included in the recommended plan. Excluding the enhancement features from the recommended plan results in no adverse environmental impacts. An economic summary of the recommended plan is shown on Table 38B.

TABLE 38B

ECONOMIC SUMMARY

RECOMMENDED PLAN

(1 OCTOBER 1984 PRICES; 1990-2040 PROJECT CONDITIONS; 8-3/8% DISCOUNT RATE)

FIRST COST	
FLOOD CONTROL	$ 70,200,000
RECREATION	$ 4,520,000
TOTAL FIRST COST	$ 74,720,000
ANNUAL COST	
FLOOD CONTROL	$ 6,116,000
RECREATION	$ 512,000
TOTAL ANNUAL COST	$ 6,628,000
ANNUAL BENEFITS	
FLOOD CONTROL	$ 9,717,000
RECREATION	$ 2,395,000
TOTAL ANNUAL BENEFITS	$ 12,112,000
NET BENEFITS (EXCESS OF BENEFITS/COSTS)	$ 5,484,000
BENEFIT/COST RATIOS	
FLOOD CONTROL	1.6:1
RECREATION	4.7:1
TOTAL PROJECT BENEFIT/COST RATIO	1.8:1

CHAPTER VIII
PLAN IMPLEMENTATION

This chapter summarizes the cost-sharing requirements and procedures necessary to implement the flood control, recreation, and fish and wildlife mitigation features of the project.

A. INSTITUTIONAL REQUIREMENTS

The various regulations which govern the extent of Federal and non-Federal participation are explained below.

For the flood control purpose, Section 3 of the 1936 Flood Control Act (Public Law 74-738), requires a non-Federal entity to provide all lands, easements, rights-of-way, and relocations for construction. It also requires non-Federal interests to administrate, maintain, and operate the constructed work. This Act also states that whenever the cost of required lands, easements and rights-of-way and all necessary alterations and relocations (non-Federal responsibility) exceed the construction cost (Federal responsibility) of the project, local interests may be reimbursed one-half of the excess cost.

Costs for fish and wildlife mitigation including land costs required for mitigation are cost-shared in the same proportion as the causative features (flood control). The non-Federal sponsor(s) of the project would assume the administration, operation, and maintenance responsibilities. The Federal Government will pay a lump sum first cost equal to the present worth of the Federal Government's share of the annual operation and maintenance costs.

For the recreation purpose, Public Law 89-72, the Federal Water Project Recreation Act of 1965, provides the basis for establishing the policy that non-Federal public agencies should participate in and administer the Federal project recreation and fish and wildlife enhancement areas. Implementing regulations (ER 1105-2-20) require that at least 50 percent of costs of recreational lands and facilities and all operation and maintenance costs be provided by non-Federal public agencies. Corps policy also requires that the Federal share of recreation costs may not exceed 10 percent of the total Federal share of the project.

B. PROJECT RESPONSIBILITIES

1. Federal Responsibilities.

a. Prepare plans and specifications.

b. Contract for and supervise construction of the project.

c. Pay no more than one-half of all recreation facility construction costs and provide credit towards construction of recreational facilities in an amount no more than one-half of the cost of lands acquired specifically for recreation access.

d. Conduct periodic inspections with the non-Federal sponsor to determine adherence to the post-construction maintenance requirements.

e. Conduct all necessary cultural resources investigations, coordination and preservation/mitigation measures.

2. Non-Federal Responsibilities.

a. Flood Control

1. Provide all lands, easements, and rights-of-way necessary for construction and maintenance of the flood control and associated mitigation measures, including all relocations and alterations of buildings, roads, highways, sewers and utilities.

2. Provide a cash or in-kind construction or land contribution toward the fish and wildlife mitigation features of the project in an amount equal to the same percentage as the non-Federal share of flood control costs.

3. Prevent obstruction or encroachment which would reduce the project's flood carrying capacity or hinder maintenance and operation, and control development in the project area to prevent undue increases in the flood damage potential.

4. Maintain and operate project facilities after completion of the project in accordance with regulations prescribed by the Secretary of the Army.

5. Comply with the applicable requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (PL 91-646).

b. Recreation

1. Provide all lands, easements, rights-of-way, and relocations required for construction and maintenance of recreation facilities. The Federal government will credit up to 50 percent of the costs of recreation lands provided for access to recreational facilities on flood control lands. Flood control lands dedicated to recreation do not qualify for Federal reimbursement or credit.

2. Make a contribution by payment, facility development, or recreation land credit sufficient to raise the non-Federal share to at least 50 percent of the total first cost of adding recreation to the project.

3. Operate and maintain (including replacements) without cost to the Federal government, the recreation lands and all facilities provided by the project, in accordance with regulations prescribed by the Secretary of the Army.

4. Acquire in its name and dedicate to public outdoor recreation use an adequate interest in all lands on which cost-shared recreation facilities are provided.

c. All Project Features

1. Hold and save the United States free from all damages arising from the construction and operation and maintenance of the completed works, except for damages due to the fault or negligence of the United States or its contractors.

C. COST APPORTIONMENT

Apportionment of first cost for the recommended plan is shown on Table 39. The total first cost for construction is $74,720,000 with $37,560,000 as the Federal share and $37,160,000 as the non-Federal share. Estimated annual operation and maintenance costs for flood control and recreation are $163,000 and $127,000, respectively, for a total of $290,000.

D. PROCEDURES AND IMPLEMENTATION

Future actions necessary for authorization and construction of the proposed plan of improvement are summarized as follows:

- This report will be reviewed within the Corps of Engineers, including the South Pacific Division, the Board of Engineers for Rivers and Harbors, and the Office of the Chief of Engineers.

- The Chief of Engineers will seek formal review and comment by the Governor of Nevada and interested Federal agencies.

- Following the State and agency review, the final report of the Chief of Engineers will be forwarded by the Assistant Secretary of the Army for Civil Works to the Congress, subsequent to obtaining the views of the Office of Management and Budget regarding the relationship of the project to programs of the President.

- Congressional review of this feasibility report and possible authorization of the project would follow.

TABLE 39

COST APPORTIONMENT
RECOMMENDED PLAN
(1 OCTOBER 1984 PRICES: 1990-2040 PROJECT
CONDITIONS; 8-3/8 PERCENT DISCOUNT RATE)

FEATURE	FEDERAL	NON-FEDERAL	TOTAL
Flood Control			
Facilities	25,900,000	-	25,900,000
Lands & Relocations	-	43,200,000	43,200,000
Subtotal	25,900,000	43,200,000	69,100,000
Fish & Wildlife Mitigation 1/	259,000	441,000	700,000
Operation & Maintenance Adjustment 2/ for Fish & Wildlife Mitigation	13,000	-13,000	N/A
Subtotal	26,172,000	43,628,000	69,800,000
Application of Section 3, 1936 Flood Control Act 3/	+8,728,000	-8,728,000	N/A
Subtotal	34,900,000	34,900,000	69,800,000
Cultural Resource Mitigation	400,000	-	400,000
Subtotal	35,300,000	34,900,000	70,200,000
Recreation			
Facilities	1,775,000	1,775,000	3,550,000
Lands 4/	-	970,000	970,000
Subtotal	1,775,000	2,745,000	4,520,000
Adjustment Credit for Lands	+ 485,000	- 485,000	N/A
Subtotal	2,260,000	2,260,000	4,520,000
TOTAL	37,560,000	37,160,000	74,720,000

Notes:

1/ F & W Mitigation is cost shared in the same proportion as the flood control purpose.
2/ Represents a present worth credit of the Federal Share of the mitigation operation and maintenance costs over the project life.
3/ Whenever the cost of required lands, easements and rights-of-way, and all necessary alterations and relocations exceed the remaining construction cost of the project, local interests may be reimbursed one-half of the excess cost. (Section 3 of the 1936 Flood Control Act).
4/ These lands are required to provide access to project lands, parking, potable water, sanitation and related developments for public control & health and safety.

TABLE 40 HAS BEEN DELETED

- o Pending project authorization for construction, the Chief of Engineers could include funds, when appropriate, in his budget requests for continuing planning and engineering of the project. The objective is to ready each project for a construction start in the shortest possible time by maintaining the momentum established with the feasibility study.

- o Following receipt of funds, continuing planning and engineering studies would be initiated, and surveys and detailed engineering designs would be accomplished.

- o Following congressional authorization of the project, plans and specifications would be accomplished by the District Engineer.

- o Subsequent to appropriation of construction funds by the Congress but prior to construction, formal assurances of local cooperation would be required from non-Federal interests.

- o Bids for construction would be invited and contracts awarded.

Following completion of construction, non-Federal interests would be responsible for operation and maintenance of flood control, recreation, and mitigation features.

It is not possible to project a schedule for the above steps because of the variables in the reviewing, advance planning, and funding processes. Once the project is authorized for construction and funded for designs and construction, it could be possible to complete design and project construction within a 9-year period if adequate funds are available.

E. VIEWS OF NON-FEDERAL INTERESTS

A list of all letters commenting on the Draft Feasibility Report and the Draft Environmental Impact Statement is shown on Table 41. Revisions and grammatical and typographical changes have been made to the report and are not presented individually. Additional information or elaboration was required to respond to some comments and is presented in Attachment 1 of the Environmental Impact Statement.

F. Sponsorship Agreements

Both the cities of Reno and Sparks and Washoe County have provided Letters of Intent assuring support and acceptance of sponsorship requirements for the Truckee Meadows Flood Control Project. These letters are shown on pages 221 to 225.

TABLE 41

LIST OF COMMENTS	
FEDERAL AGENCIES	DATE
Department of Housing and Urban Development, Reno Service Office, Region IX	13 Jan 84
Department of Agriculture, Soil Conservation Service	23 Jan 84
Environmental Protection Agency, Region IX	31 Jan 84
Department of Interior:	
Bureau of Reclamation, Mid-Pacific Regional Office	
Bureau of Reclamation, Lahontan Basin Projects Office	
Office of the Secretary, Pacific Southwest Region	
Bureau of Land Management	5 Jan 84
Fish and Wildlife Service, Great Basin Complex Office	30 Jan 84
Advisory Council on Historic Preservation	13 Dec 83
STATE AGENCIES	
Department of Conservation and Natural Resources, Division of Environmental Protection	5 Jan 84
State Clearinghouse, Office of Community Services	
Nevada Division of State Parks	
Department of Wildlife	16 Jan 84
Department of Conservation and Natural Resources, Division of Environmental Protection	5 Jan 84
Division of Water Planning	23 Jan 84
Department of Conservation and Natural Resources, Division of Historic Preservation and Archeology	10 Jan 84
CITY/COUNTY	
Washoe County, Department of Public Works	17 Feb 84
City of Reno, Robert Jackson, Public Works Director	5 Apr 84
City of Sparks, Public Works Department	30 Jan 84
Regional Administrative Planning Agency, Washoe Council of Governments	27 Jan 84
BUSINESS/PROFESSIONAL/AND PRIVATE	
Stephen C. Mollath, Attorney for Bella Vista Ranch	26 Jan 84
University of Nevada, Reno, Physical Plant Department	8 Feb 84
Law Offices of Eisenhower, Carlsen, Newlands, Rhea, Harriot and Quinn	2 Feb 84
Michael R. Thorp, Tribal Attorney, Pyramid Lake Paiute Tribe	30 Jan 84
Sierra Pacific Power Company	30 Jan 84

G. LOCAL FINANCING

The capability of the project sponsors to finance the local share of the project can be assessed by the sponsors' current indebtedness. As of June 1984 the outstanding General Obligation (GO) bond debt of the local governments was approximately $70 million; $20 million was self-supporting and $50 million was supported by direct tax revenues. These bonds have an excellent rating (A rating by both Moodys' Invested Service and Standard and Poors) indicating an outstanding payment record. There are no records of any bonds that have failed due to inadequate bond payments. The State of Nevada Statutes sets limits on the total debt for GO bonds which is based on a percentage (10% for Washoe County, 15% for Reno and 20% for Sparks) of the assessed value of all taxable property within the jurisdiction. The total assessed value of property within Reno and Sparks is in excess of $2.2 billion which would provide a legal debt limit of approximately $340 million. The non-Federal project cost of about $40 million, plus the outstanding debt of $70 million is well within the legal limits as set for GO bond financing. Another method of project financing could involve the establishment of special assessment districts whereby fees would be levied to property owners directly benefiting from the project. This appears feasible, considering the assessed value of property affected by the project is estimated to be in excess of $1 billion. The assessed value of property is established by State of Nevada law at 35% of the full market value of the property.

City of Reno
POST OFFICE BOX 1900 • RENO, NEVADA 89505

November 19, 1984

Colonel Arthur Williams
District Engineer, Sacramento District
United States Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Colonel Williams:

Re: Flood Control Plan

The City Council, City of Reno, has given careful study to the flood control planning performed by the Corps of Engineers. On November 6, 1984, the Council took action to support a flood control plan as outlined in the Corps of Engineers' Draft Feasibility Report, dated October 1983, with some reservations.

Since the City Council has been given assurances that it will have involvement in any final plan/design that will be developed, to ensure a plan that will be the most cost-effective and least disruptive to the community, the Council has expressed its willingness to accept responsibility for its pro rata (benefit) share of the local participation aspects of the final plan yet to be finalized. This assurance is contingent upon final plan/design approvals by the City and upon participation commitments from Washoe County and the City of Sparks and as governed by applicable provisions of the Nevada Revised Statutes.

In agreeing to proceed with development of the final plans and design aspects of flood control and recreational improvements resulting therefrom, it is understood that the City's share of the financing allocations will not be committed until such time as Congress appropriates funds for continuation of the project, as approved. Once approved, the City will proceed with its financing plan, which is expected to include a bond issue referendum, creation of a special flood benefit district, together with other fiscal sources.

On behalf of the Council and citizens of the community, we would like to express appreciation to the Corps and its staff for the continuing support and assistance in this project. We look forward to receiving approvals for Congressional funding to this important flood control project.

By Direction of the City Council,

Chris Cherches
City Manager

CC:lr

The City of Sparks

Office of the
CITY MANAGER

December 17, 1984

Colonel Arthur Williams
District Engineer
Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

This letter is to inform you that the Sparks City Council at its regular meeting of November 26, 1984 authorized the City Manager to furnish you with a letter which indicates the City of Sparks' intent to participate in the recommended Truckee Meadows Flood Control Plan. This letter of intent is issued based on our understanding that the final design of the project will be subject to review and approval by the local participating entities and that the final commitment of funds by the local entities is not required prior to the appropriation of construction funds by the Congress.

The City of Sparks agrees to accept responsibility for its pro rata share of the following local participation aspects of the plan contingent upon similar participation by the City of Reno and Washoe County.

A. Flood Control (total non-federal project costs currently estimated at $26,570,000 - October 1982 prices)

1. Provide all lands, easements and rights-of-way necessary for construction and maintenance of the flood control measures, including all relocations and alterations of buildings, roads, highways, bridges, sewers and utilities.

2. Prior to construction, acquire all lands, easements and rights-of-way for developing and maintaining wildlife mitigation areas.

3. Upon final project approval, prevent encroachment on channels which would impair the flood control purpose of the project.

City Hall: 431 Prater Way, Sparks, Nevada 89431, (702) 356-2310

4. Hold and save the United States free from all damages arising from the construction and operation of the completed works, except for damages due to the fault or negligence of the United States or its contractors.

5. Maintain and operate project facilities after completion of the project in accordance with regulations prescribed by the Secretary of the Army and Section 221 of the 1970 Flood Control Act.

6. Comply with the applicable requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (PL 91-646).

7. If the above non-federal requirements result in local flood control costs in excess of 50 percent of the project's total costs for flood control, then we request that the total flood control costs be shared 50/50 (federal/local) as allowed for in Section 3 of the 1936 Flood Control Act.

B. Recreation (total non-federal project costs currently estimated at $7,089,000 - October 1982 prices)

1. Provide all lands, easements and rights-of-way and relocations specifically required for construction and maintenance of recreation facilities. The Federal government will reimburse or credit 50 percent of the costs of recreation lands provided for access to flood control lands. Flood control lands dedicated to recreation do not qualify for federal reimbursement or credit.

2. Provide contribution by payment, facility development or recreation land credit sufficient to raise the non-federal share to at least 50 percent of the total cost of adding recreation to the project. The federal share of recreation costs cannot exceed 10 percent of the federal first cost for flood control features.

3. Operate and maintain (including replacements) without cost to the federal government the recreation lands and all facilities provided by the project, in accordance with regulations prescribed by the Secretary of the Army.

We wish to thank the Corp and it's staff for their support and assistance in this proposed project and we look forward to continued

cooperation in the implementation of our mutual flood control efforts.

Sincerely,

Patricia S. Thompson

PATRICIA S. THOMPSON
CITY MANAGER

PT:DRR;jg

cc: Robert Young, Washoe County Dept. of Comprehensive Planning
Leonard Crow, Washoe County Dept. of Comprehensive Planning
John MacIntyre, Washoe County Manager
Chris Cherches, Reno City Manager

WASHOE COUNTY

"To Protect and To Serve"

OFFICE OF THE COUNTY MANAGER

1205 MILL STREET
POST OFFICE BOX 11130
RENO, NEVADA 89520 — 0027
PHONE (702) 785-4179

August 17, 1984

Colonel Arthur Williams
District Engineer, Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

This letter is to inform you that the Washoe County Board of Commissioners at its meeting of August 14, 1984, authorized the County Manager to furnish you with the required assurance that Washoe County intends to cooperate in effecting the recommended Truckee Meadows Flood Control Plan as proposed in the Corps of Engineers' Draft Feasibility Report dated October 1983.

By means of this Letter of Intent, the Washoe County Board of Commissioners hereby agrees to accept responsibility for its pro rata share of the following local participation aspects of the plan, contingent upon similar participation by the Cities of Sparks and Reno, and as governed by applicable provisions of the Nevada Revised Statutes:

A. FLOOD CONTROL (Total Non-Federal Project Costs Currently Estimated at $26,570,000 - October 1982 Prices)

1. Provide all lands, easements and rights-of-way necessary for construction and maintenance of the flood control measures, including all relocations and alterations of buildings, roads, highways, bridges, sewers and utilities.

2. Prior to construction, acquire all lands, easements and rights-of-way for developing and maintaining wildlife mitigation areas.

3. Upon final project approval, prevent encroachment on channels which would impair the flood control purpose of the project.

WASHOE COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER

4. Hold and save the United States free from all damages arising from the construction and operation of the completed works, except for damages due to the fault or negligence of the United States or its contractors.

5. Maintain and operate project facilities after completion of the project in accordance with regulations prescribed by the Secretary of the Army and Section 221 of the 1970 Flood Control Act.

6. Comply with the applicable requirements of "The Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970 (PL 91-646).

7. If the above non-federal requirements result in local flood control costs in excess of 50 percent of the project's total costs for flood control, then we request that the total flood control costs be shared 50/50 (federal/local) as allowed for in Section 3 of the 1936 Flood Control Act.

B. RECREATION (Total Non-Federal Project Costs Currently Estimated at $7,089,000 - October 1982 Prices)

1. Provide all lands, easements and rights-of-way and relocations specifically required for construction and maintenance of recreation facilities. The Federal government will reimburse or credit 50 percent of the costs of recreation lands provided for access to flood control lands. Flood control lands dedicated to recreation do not qualify for Federal reimbursement or credit.

2. Provide contribution by payment, facility development or recreation land credit sufficient to raise the non-federal share to at least 50 percent of the total first cost of adding recreation to the project. The Federal share of recreation costs cannot exceed 10 percent of the Federal first cost for flood control features.

3. Operate and maintain (including replacements) without cost to the Federal government the recreation lands and all facilities provided by the project, in accordance with regulations prescribed by the Secretary of the Army.

In transmitting this Letter of Intent, it is mutually understood that our pro rata share of the local financial responsibility will not be committed until Congress appropriates funds for construction of the project.

We wish to express our appreciation to the Corps for your continuing support and assistance in this project.

Sincerely,

John MacIntyre
Washoe County Manager

JM/mf

CHAPTER IX

DISCUSSION

In the interest of the public, the District Engineer has reviewed and evaluated the information contained in the environmental statement; other documents concerning the Reno-Sparks Metropolitan area, and views of other agencies, organizations, and individuals on economic, environmental, and other impacts of the plans for improvement of the Reno-Sparks Metropolitan area. The District Engineer concurs in the recommendations of the U.S. Fish and Wildlife Service as set forth in their April 1984 final Coordination Act Report. In addition, he has personally inspected the project area and has participated in meetings with local governmental officials, representatives of other agencies and organizations, and landowners and other concerned members of the public.

The possible consequences of building levees and floodwalls, replacing bridges, excavating the channel, providing recreation facilities, and purchasing and developing fish and wildlife habitat were studied and evaluated for environmental impacts; social and economic effects; engineering feasibility; compliance with executive orders and legal statutes; appropriateness for meeting the stated objectives of the investigation; and implementability.

It has been found that the action proposed is based on a thorough evaluation of all viable alternatives. The project is in consonance with national policy, existing statutes, and administrative directives. Further, construction of the proposed project is supported by the Cities of Reno and Sparks and Washoe County. The environmental statement meets or exceeds the requirements of the National Environmental Policy Act.

General legislation authorizing implementation of water resources projects, the most recent being the Water Resources Development Act of 1976, contain local cooperation requirements established by enactment of various laws. The Administration is currently reviewing project cost sharing and financing across the entire spectrum of water resources development functions and has submitted proposed legislation for water projects to the Congress. The basic principle governing the development of specific cost-sharing policies is that, whenever possible, the cost of services produced by water projects should be paid by their direct beneficiaries.

While specific cost-sharing policies applicable to the project have not yet been established, non-Federal interests can expect that, under the Administration's financing and cost-sharing principles, the level of their financial participation may be greater than in the past.

CHAPTER X

RECOMMENDATION

I recommend that the plan described herein for flood control and recreation be authorized for implementation as a Federal project, with such modifications as in the discretion of the Chief of Engineers may be advisable, and subject to cost sharing and financing arrangements satisfactory to the President and the Congress. I further recommend, in accordance with Section 3 of the Flood Control Act of 1936 (PL 74-738), that if the non-Federal flood control feature costs for lands, easements, rights-of-way, and relocations exceed the construction cost for the flood control features, the non-Federal sponsor concerned will be reimbursed one-half of its excess expenditures over said construction cost. The project would include the construction of levees, floodwalls, detention basin, recreation facilities, and the purchase of lands and development of facilities for fish and wildlife mitigation. The total Federal first cost of the project is estimated at $37,560,000 (October 1984 price level). This recommendation is made with the provision that, prior to implementation, non-Federal interests will, in addition to the general requirements of law for this type of project, agree to comply with the following requirements:

a. Provide without cost to the United States all lands, easements, and rights-of-way including borrow areas and disposal areas for excavated material determined suitable by the Chief of Engineers and necessary for construction, operation, and maintenance of the flood control, mitigation, and recreation features of the project.

b. Hold and save the United States free from damages due to construction and subsequent operation and maintenance of the project, not including damages due to the fault or negligence of the United States or its contractors.

c. Operate and maintain without cost to the United States all project works after completion in accordance with regulations prescribed by the Secretary of the Army.

d. Accomplish without cost to the United States all alterations and relocations or removal of buildings, transportation facilities, storm drains, utilities, and other structures and improvements made necessary by the construction of the flood control and recreation features of the project, excluding railroad bridges and approaches thereto and facilities necessary for the normal interception and disposal of local interior drainage at the line of protection.

e. Prior to initiation of construction, prescribe and enforce regulations to prevent obstruction or encroachment which would reduce the project's flood-carrying capacity or hinder maintenance and operation, and control development in the project area to prevent undue increases in the flood damage potential.

f. Publicize flood plain information in the areas concerned and provide this information to zoning and other regulatory agencies for their guidance and leadership in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to insure compatibility between future development and protection levels provided by the project.

g. Operate and maintain the fish and wildlife mitigation feature of the project. The costs of such will be apportioned at the same percentage as the flood control costs.

h. Provide a cash or in-kind construction or land contribution toward the fish and wildlife mitigation features of the project in an amount equal to the same percentage as the flood control costs.

i. Provide a cash or in-kind contribution for recreation facilities and land required to permit public access to recreation facilities sufficient to bring the non-Federal share of total recreation development costs to 50 percent.

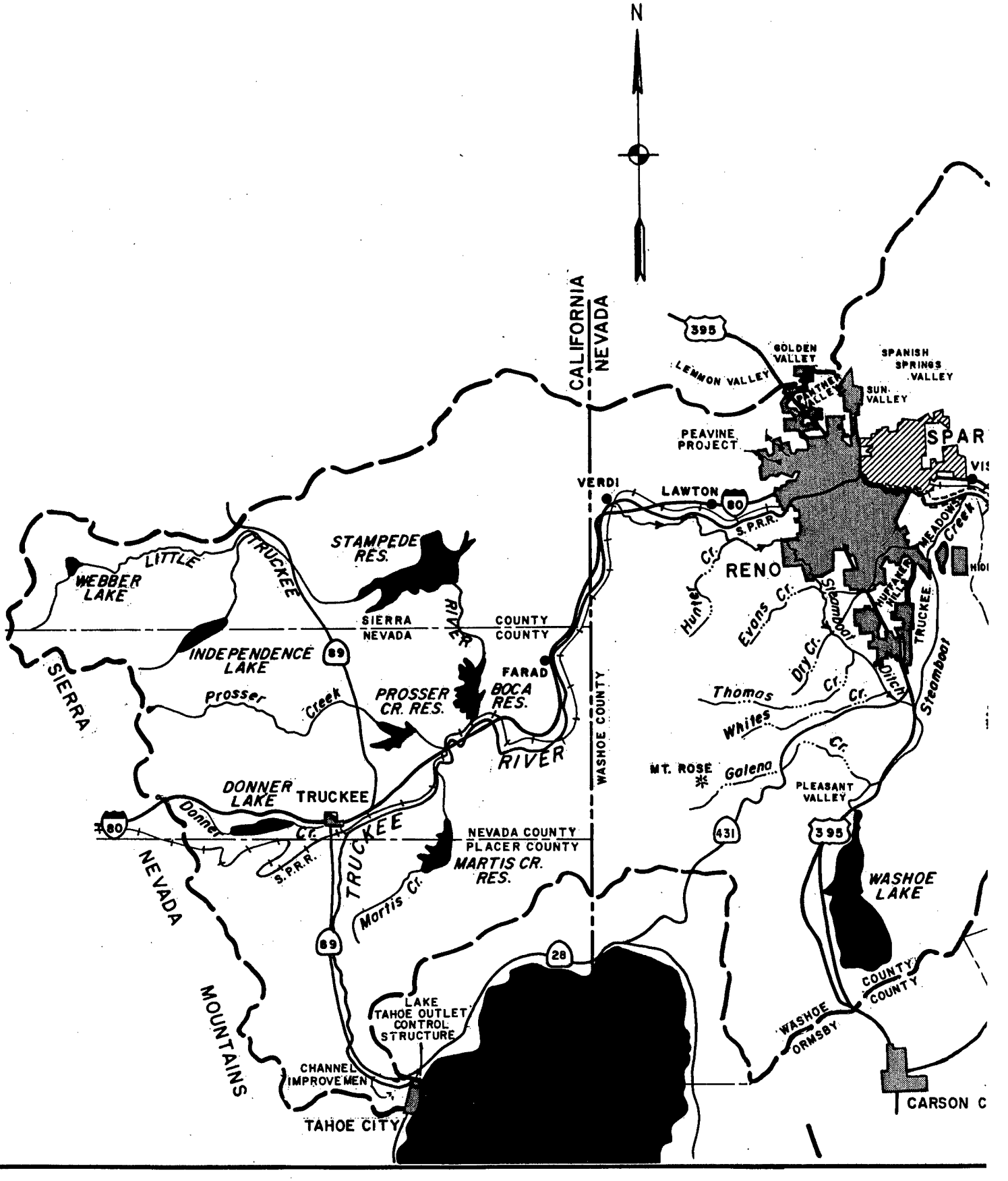
j. Comply with the applicable requirements of the "Uniform Relocation Assistance and Real Property Acquisition Policies Act" of 1970.

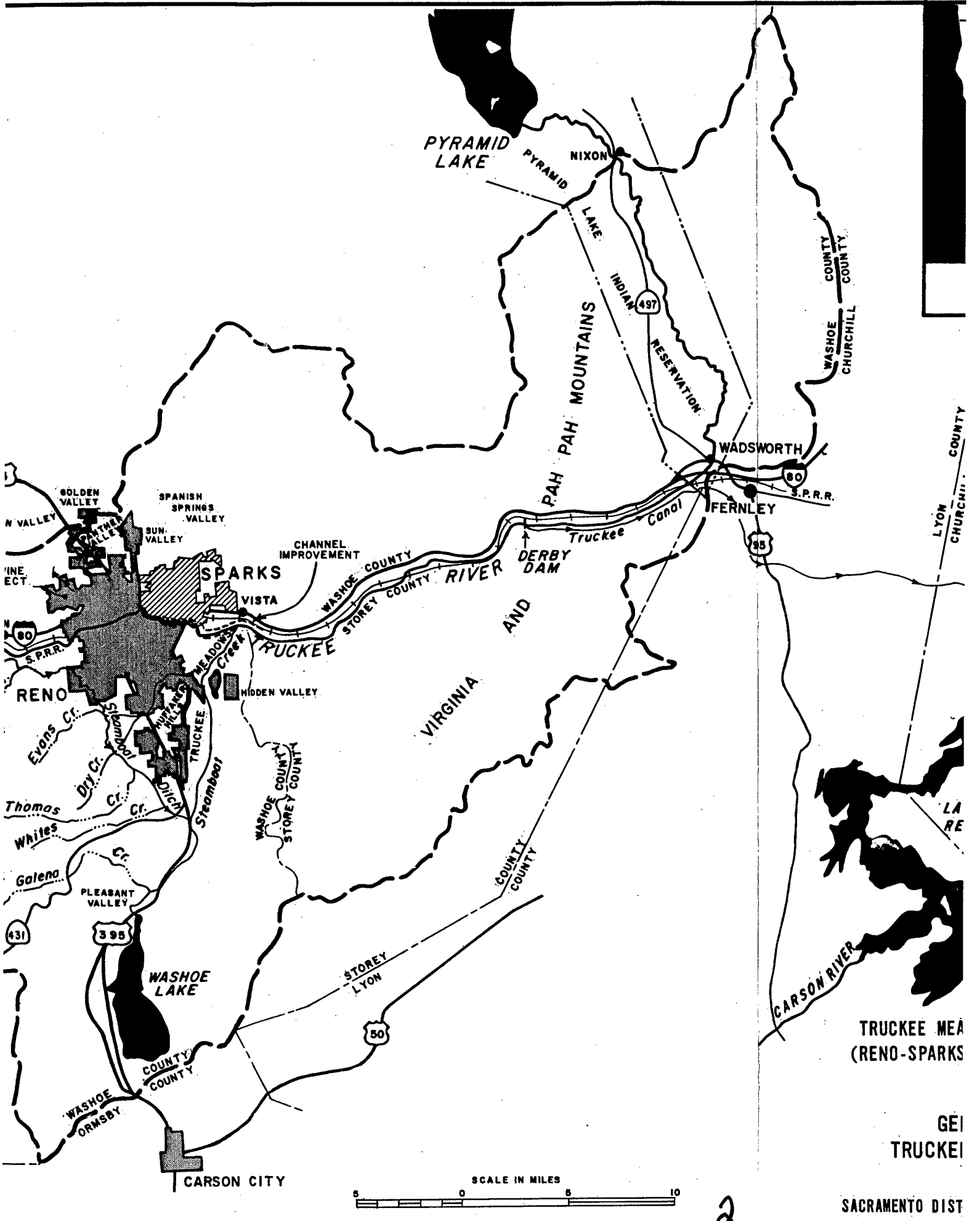
k. Assure access to the recreation facilities to all on equal terms.

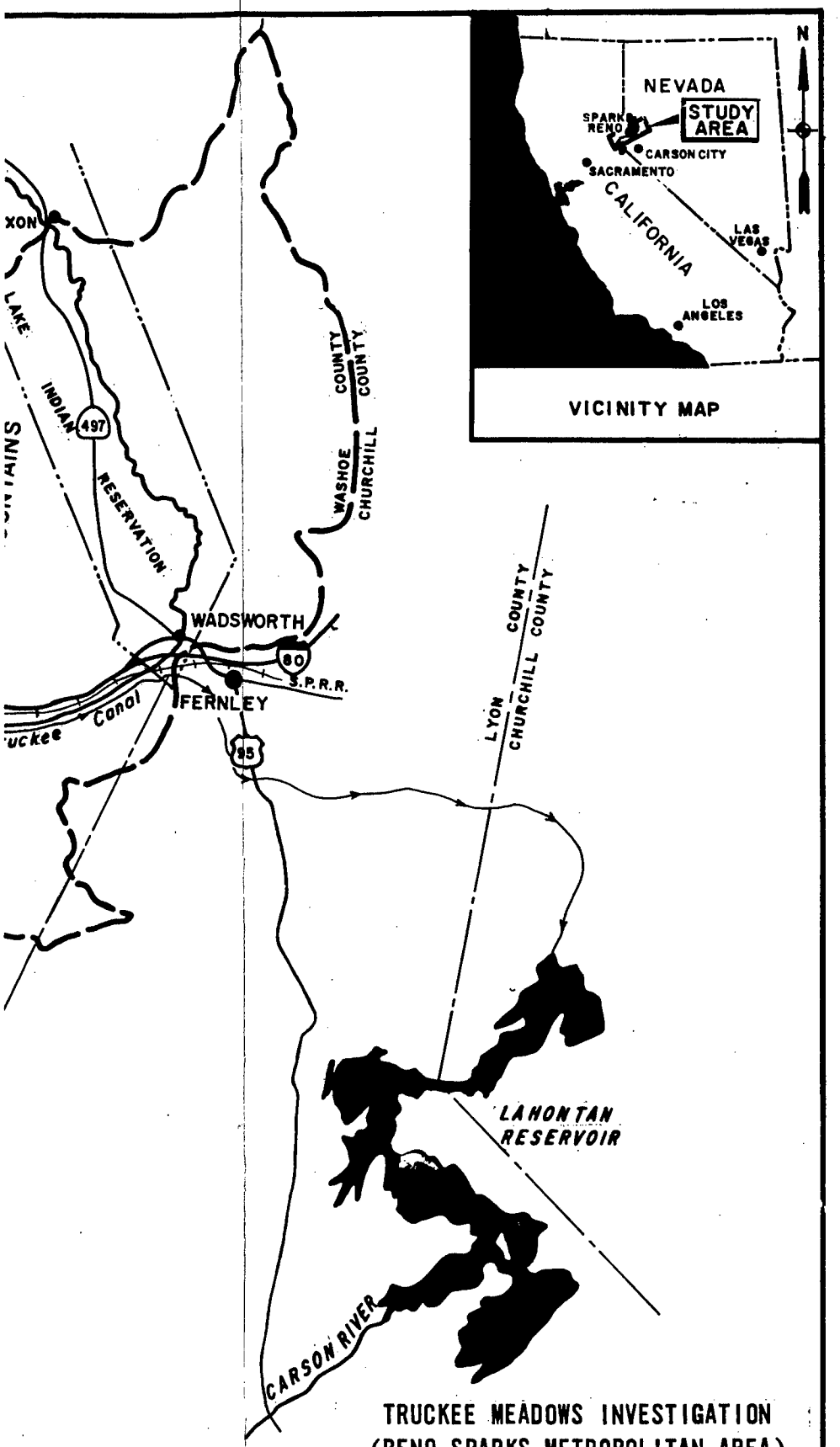
l. Operate, maintain, and replace, without cost to the United States all recreation facilities of the project.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

ARTHUR E. WILLIAMS
Colonel, CE
District Engineer


N
CALIFORNIA
NEVADA
395
GOLDEN VALLEY
SPANISH SPRINGS VALLEY
LEMMON VALLEY
SUN VALLEY
PEAVINE PROJECT
VERDI
LAWTON
80
S.P.R.R.
RENO
STAMPEDE RES.
WEBBER LAKE
LITTLE TRUCKEE
SIERRA COUNTY
NEVADA COUNTY
INDEPENDENCE LAKE
89
PROSSER CR. RES.
FARAD
BOCA RES.
Prosser Creek
SIERRA NEVADA MOUNTAINS
WASHOE COUNTY
RIVER
DONNER LAKE
TRUCKEE
Donner Cr.
NEVADA COUNTY
PLACER COUNTY
MARTIS CR. RES.
Martis Cr.
TRUCKEE
Hunter Cr.
Evans Cr.
Steamboat Ditch
Dry Cr.
Thomas Cr.
Whites Cr.
MT. ROSE
Galena Cr.
PLEASANT VALLEY
431
WASHOE LAKE
28
LAKE TAHOE OUTLET CONTROL STRUCTURE
CHANNEL IMPROVEMENT
TAHOE CITY
WASHOE COUNTY
ORMSBY
CARSON C


PYRAMID LAKE
NIXON
PYRAMID LAKE
INDIAN RESERVATION
497
PAH PAH MOUNTAINS
WASHOE COUNTY
CHURCHILL COUNTY
WADSWORTH
80
S.P.R.R.
FERNLEY
Truckee Canal
DERBY DAM
95
LYON COUNTY
CHANNEL IMPROVEMENT
WASHOE COUNTY
STOREY COUNTY
TRUCKEE RIVER
AND
VIRGINIA
GOLDEN VALLEY
SPANISH SPRINGS VALLEY
SUN VALLEY
SPARKS
VISTA
RENO
Meadows
Creek
HIDDEN VALLEY
Evans Cr.
Steamboat
Dry Cr.
Thomas Cr.
Whites Cr.
Galena Cr.
Ditch
TRUCKEE
Steamboat
WASHOE COUNTY
STOREY COUNTY
PLEASANT VALLEY
431
395
WASHOE LAKE
STOREY
LYON
COUNTY
COUNTY
50
WASHOE
ORMSBY
CARSON CITY
CARSON RIVER
SCALE IN MILES
5 0 5 10
TRUCKEE MEA
(RENO-SPARKS
GE
TRUCKE
SACRAMENTO DIST
FE
2



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

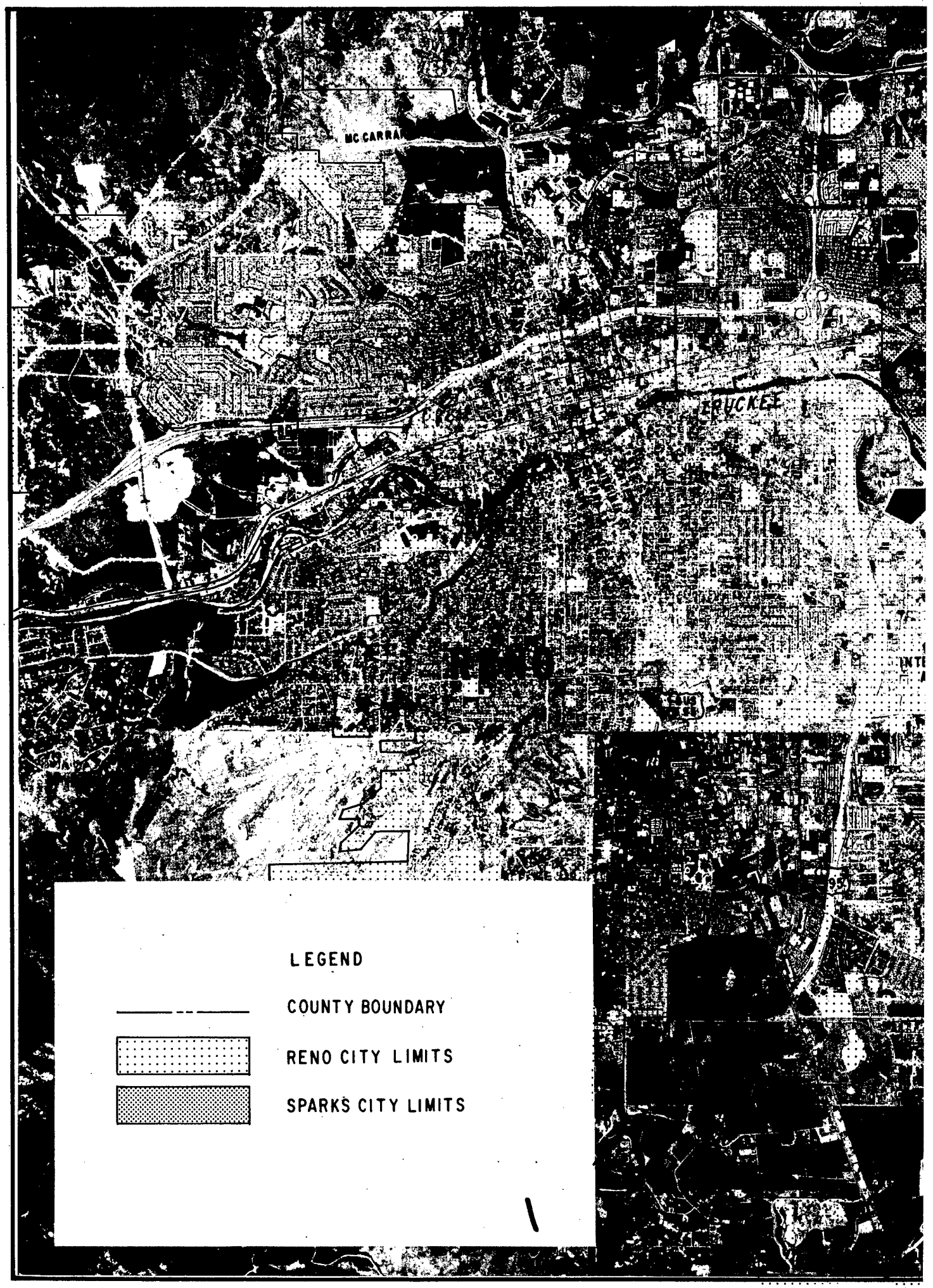
GENERAL MAP
TRUCKEE RIVER BASIN

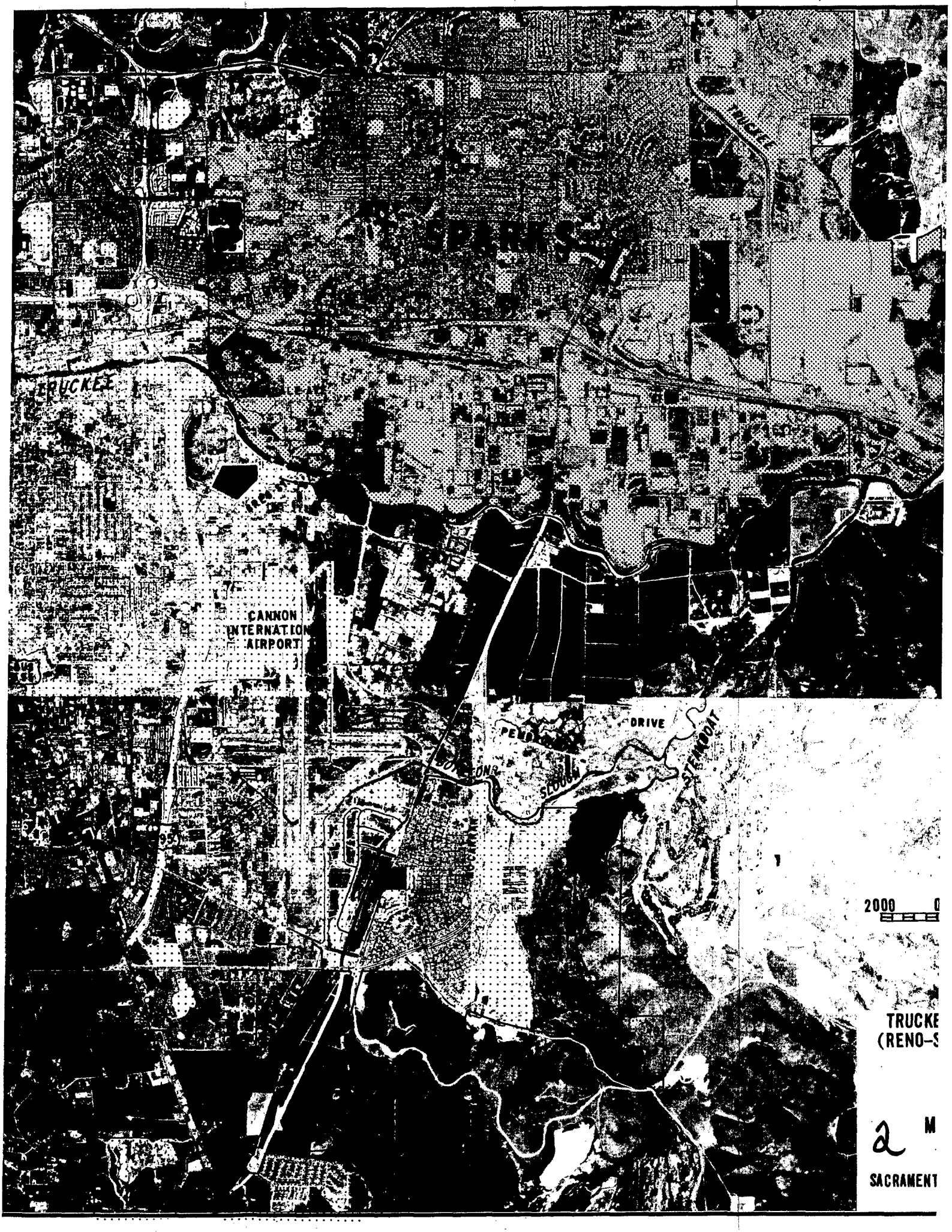
10

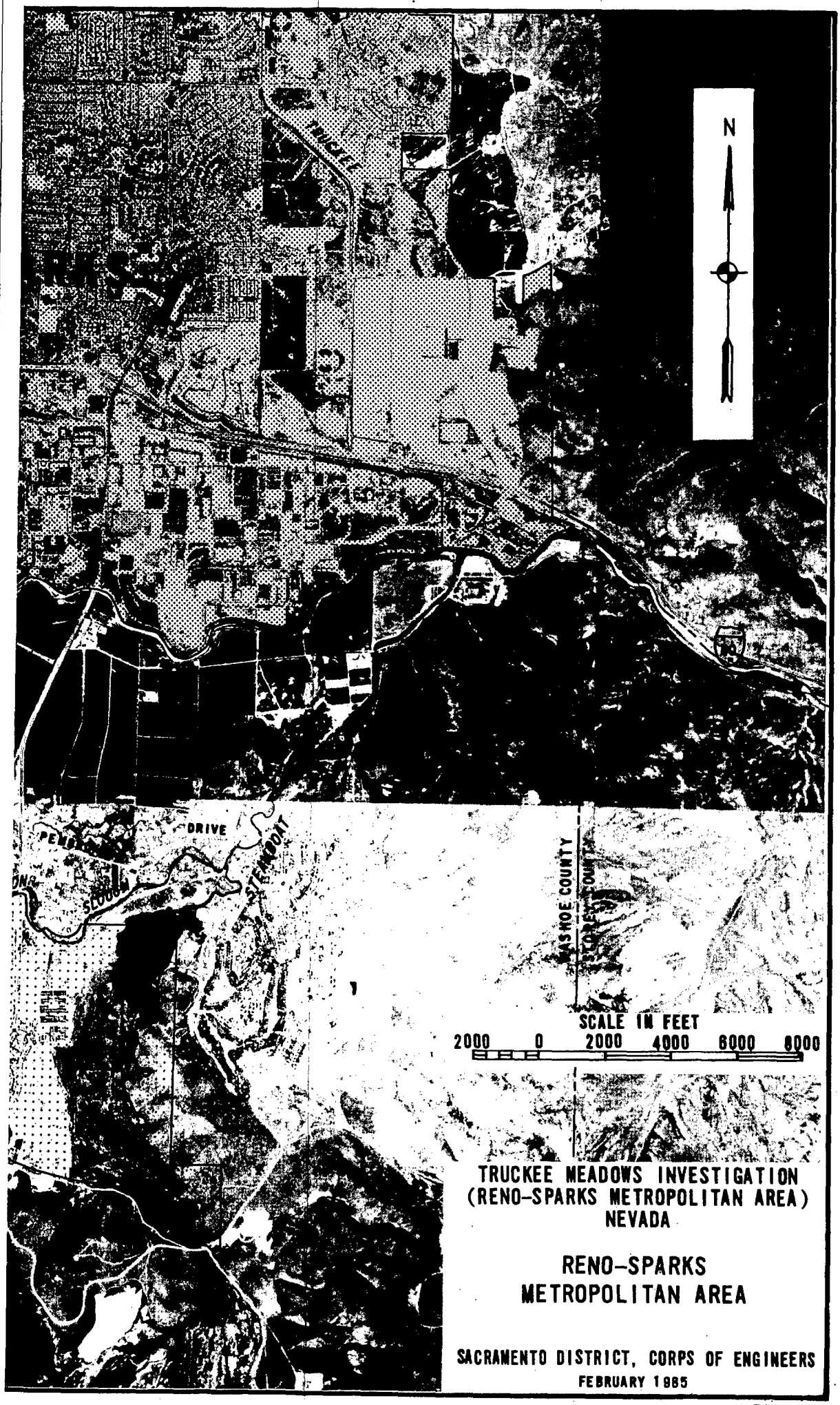
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE I


MC CARRAN
TRUCKEE
LEGEND
COUNTY BOUNDARY
RENO CITY LIMITS
SPARKS CITY LIMITS


TRUCKEE
TRUCKEE
CANNON
INTERNATIONAL
AIRPORT
DRIVE
SLOUGH
STEAMBOAT
2000



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

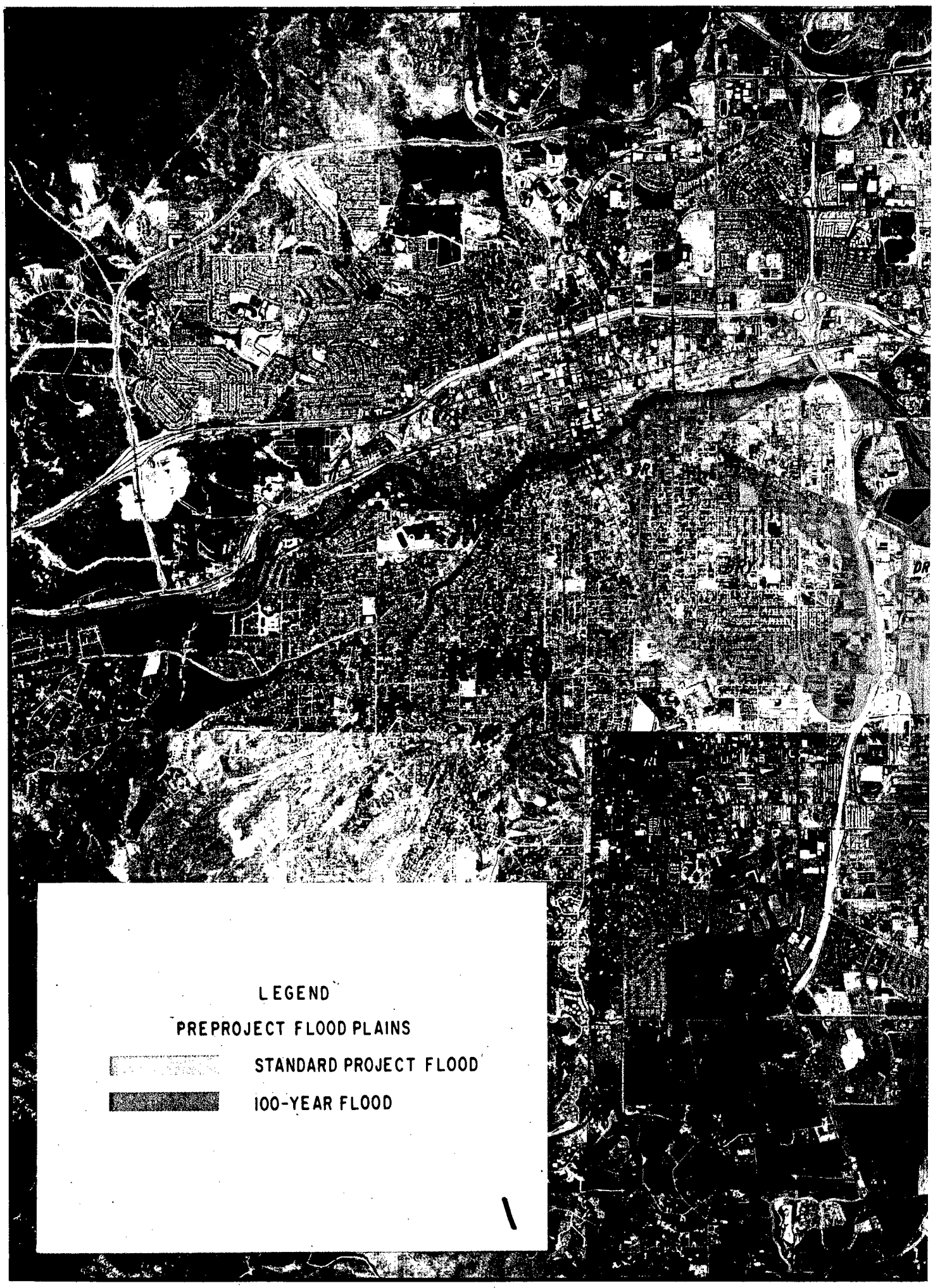
RENO-SPARKS METROPOLITAN AREA

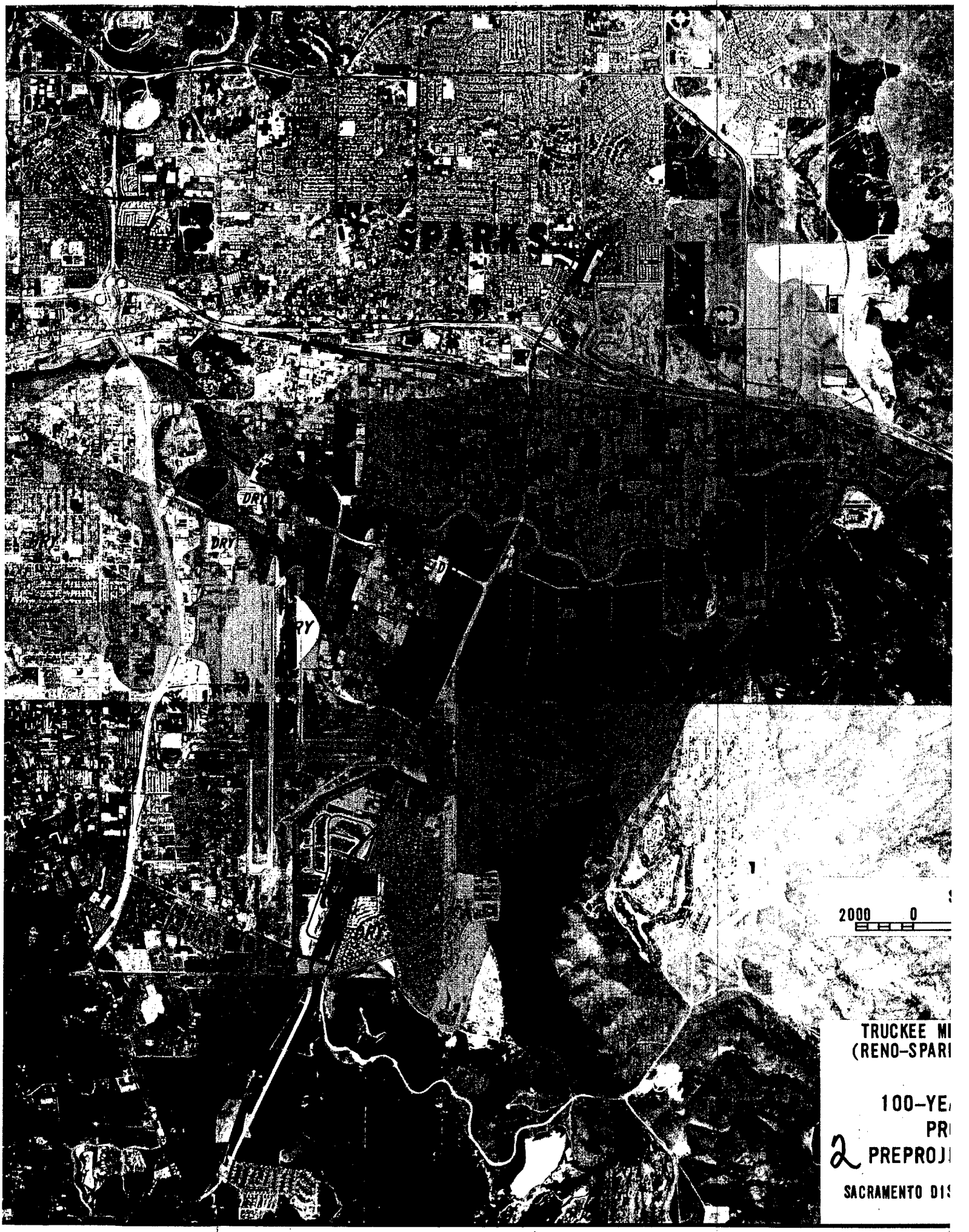
SACRAMENTO DISTRICT, CORPS OF ENGINEERS

FEBRUARY 1985

3

PLATE 2


LEGEND
PREPROJECT FLOOD PLAINS
STANDARD PROJECT FLOOD
100-YEAR FLOOD

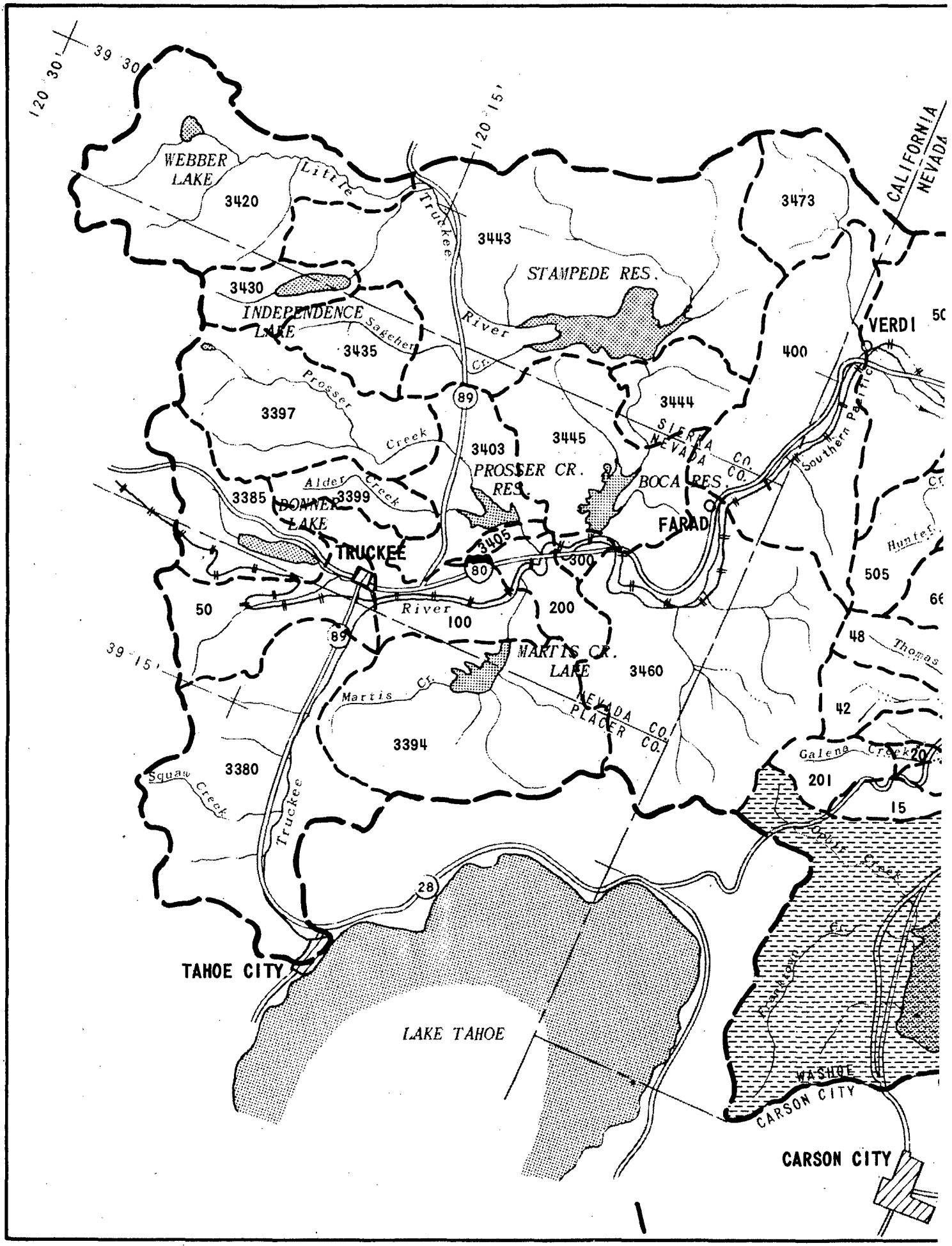

SPARKS
DRY
DRY
DRY
2000
0
TRUCKEE MI
(RENO-SPARI
100-YE
PR
2 PREPROJ
SACRAMENTO DI

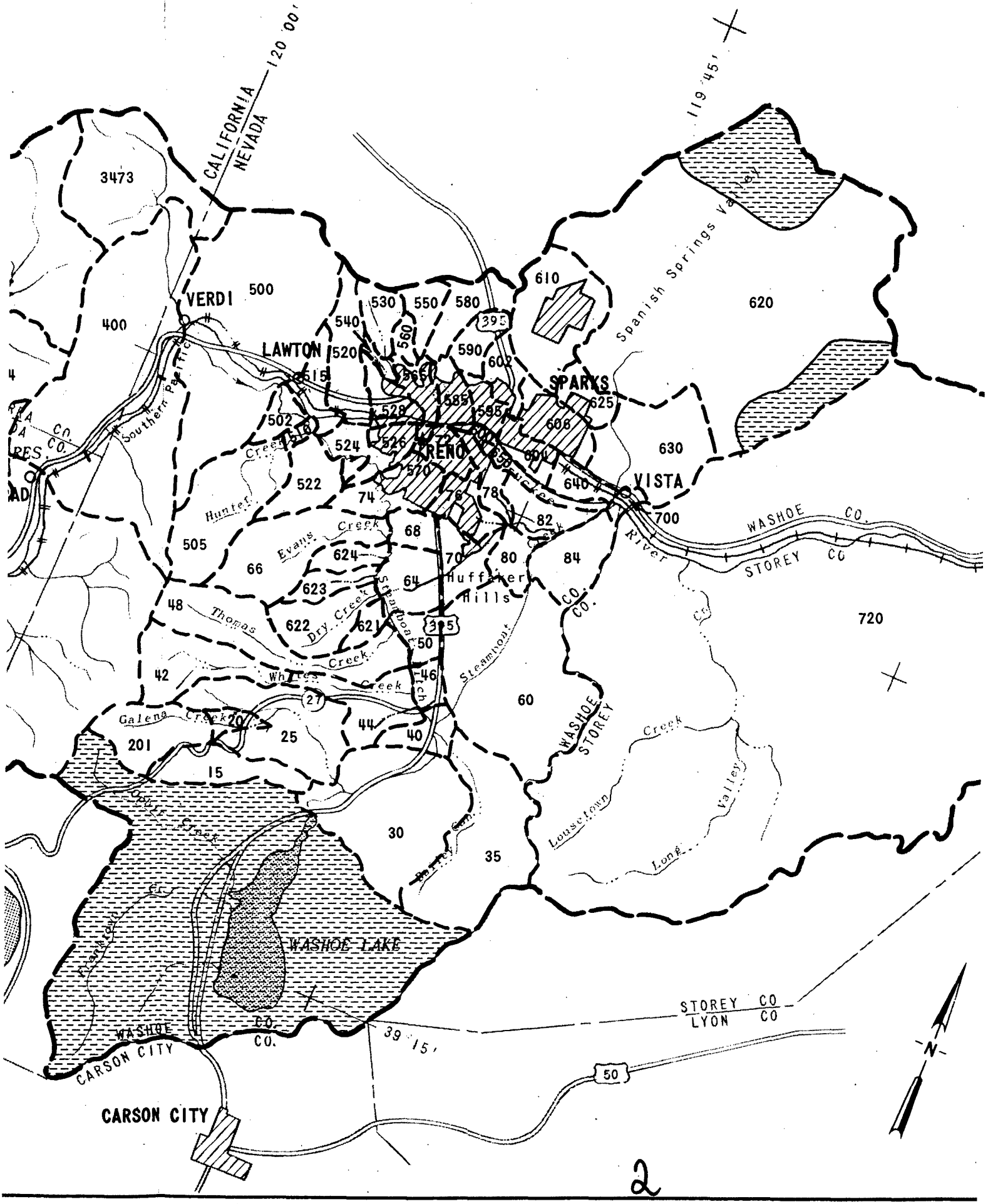
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

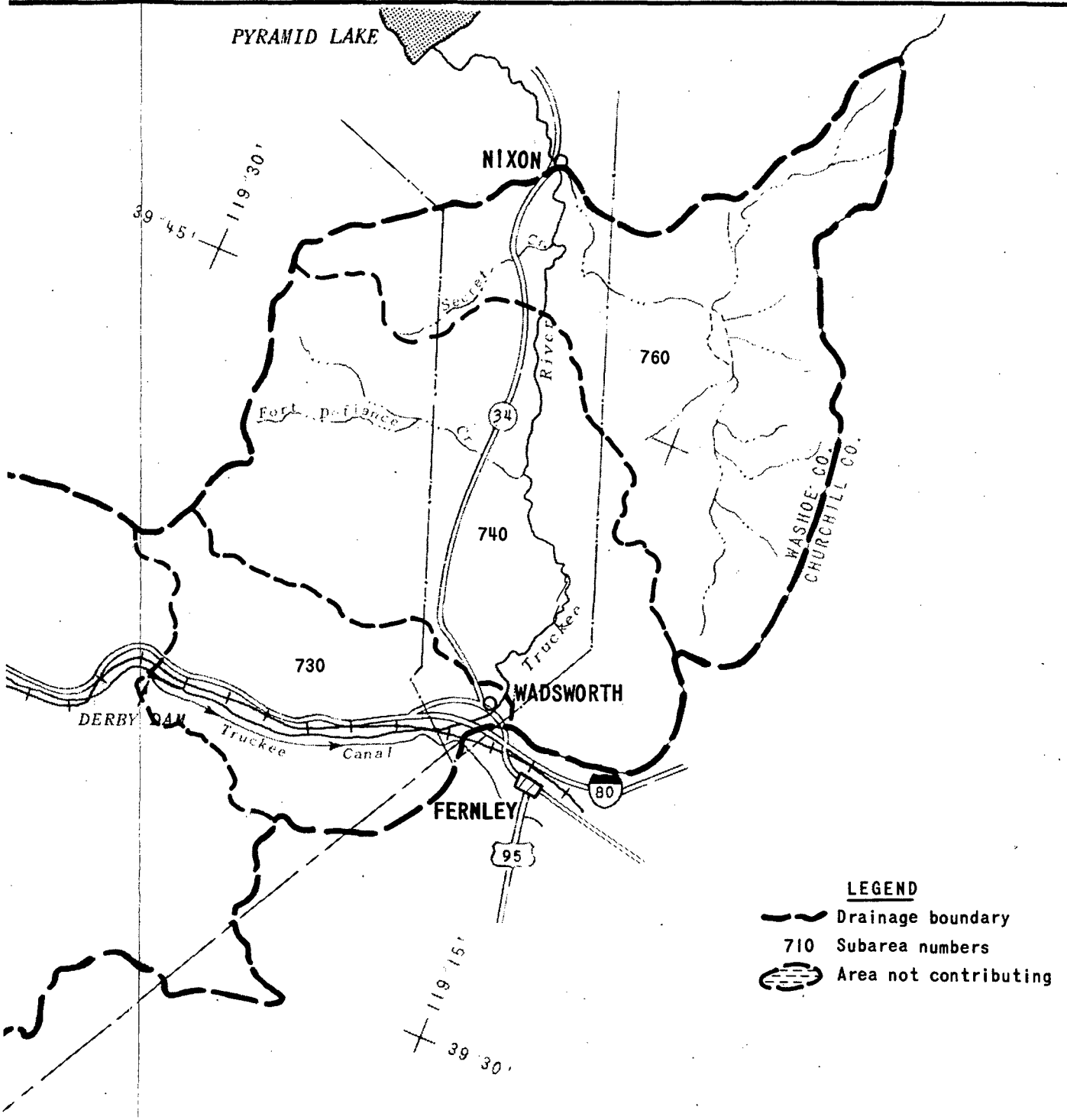
100-YEAR AND STANDARD PROJECT FLOOD
3 PREPROJECT FLOOD PLAINS

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 3


120° 30'
39° 30'
120° 15'
39° 15'
WEBBER LAKE
Little Truckee River
3420
3443
3473
CALIFORNIA
NEVADA
STAMPEDE RES.
3430
INDEPENDENCE LAKE
Sagehen Cr.
River
3435
400
VERDI
Prosser Creek
89
3397
3444
3445
3403
SIERRA NEVADA CO.
Southern Pacific
PROSSER CR. RES.
BOCA RES.
Alder Creek
3385
DONNER LAKE
3399
FARAD
TRUCKEE
3405
80
300
505
Hunter
50
River
100
200
89
48
Thomas
MARTIS CR. LAKE
3460
Martis Cr.
NEVADA CO.
PLACER CO.
42
3394
Galena Creek
3380
Squaw Creek
Truckee
201
15
28
TAHOE CITY
LAKE TAHOE
WASHOE
CARSON CITY
CARSON CITY


CALIFORNIA
NEVADA
120 00'
119 45'
39 15'
3473
VERDI
500
400
LAWTON
520
530
550
580
540
560
590
602
615
565
585
595
528
502
524
526
570
522
74
78
68
624
623
622
621
505
66
48
42
201
15
25
20
44
40
50
46
64
70
80
84
82
60
30
35
610
620
625
608
630
640
700
720
SPARKS
RENO
VISTA
Spanish Springs Valley
Southern Pacific
Hunter Creek
Evans Creek
Dry Creek
Thomas Creek
Whites Creek
Galena Creek
Steamboat Creek
Huffaker Hills
Truckee River
Truckee Canal
Steamboat Ditch
Orr Ditch
Lousetown Valley
Long Valley
WASHOE LAKE
WASHOE CO.
STOREY CO.
LYON CO.
CARSON CITY
395
50
27
N



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

SUBAREA MAP

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

3

PLATE 4

GRAPHIC SCALE

1" = 800'

0' 400' 800' 1600' 2400

NOTE: AERIAL PHOTOGRAPHY FLOWN, MAY 1981

APHIC SCALE

1600' 2400' 3200' 4000'

FLOWN, MAY 1981

LEGEND

= PROPO

= PROPO

= PROPC

= PHOTC

= PROPC

R.M. 55.0 = RIVER

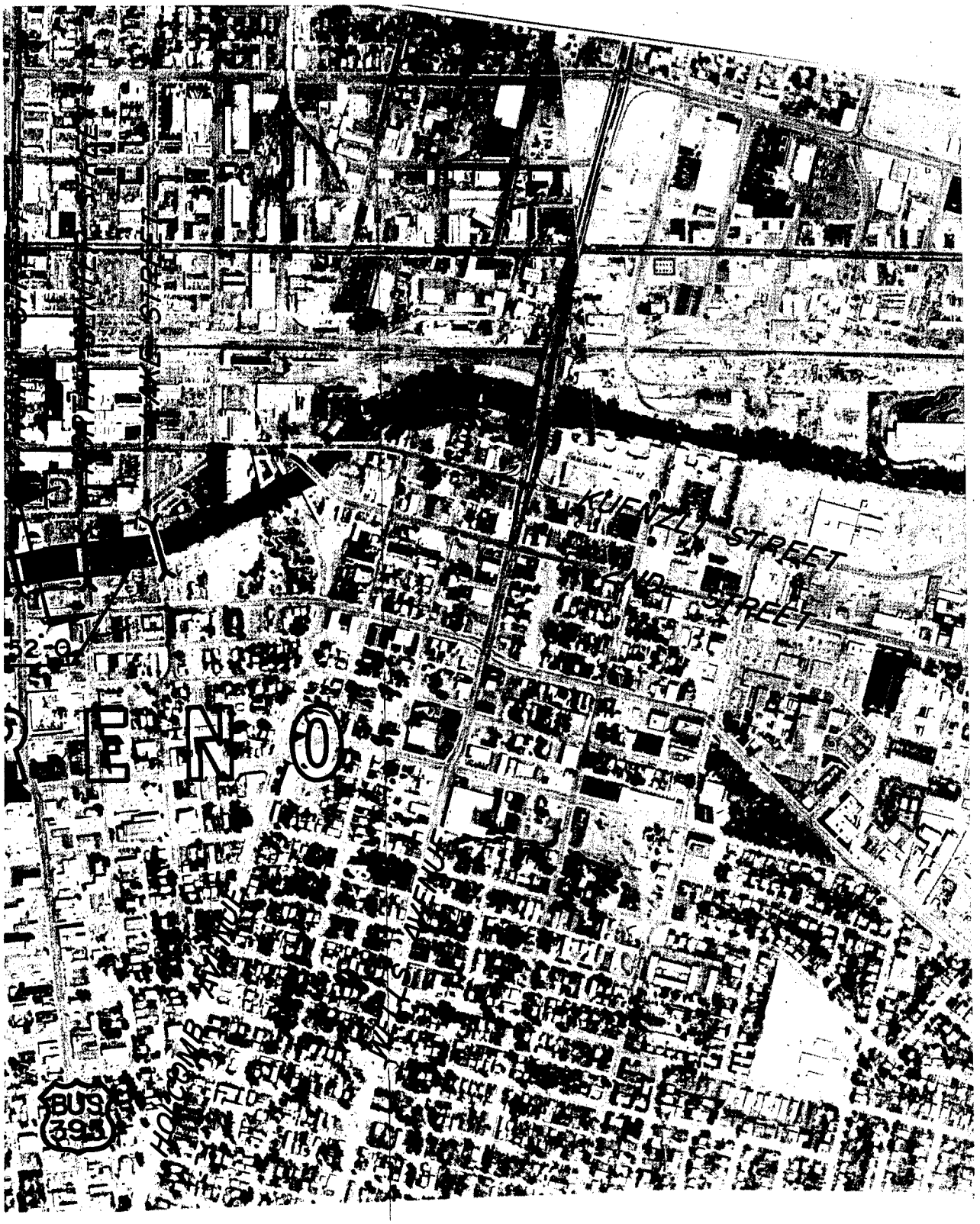
= CROS

2

LEGEND

- = PROPOSED LEVEES
- = PROPOSED CHANNEL ENLARGEMENT
- = PROPOSED FLOOD WALL
- = PHOTO SHEET OUTLINE
- = PROPOSED BRIDGE REPLACEMENT
- = RIVER MILE
- = CROSS SECTION (R.M.)

3



TRUCKEE MEADOWS INVESTIGATIONS
RENO-SPARKS METROPOLITAN AREA, NEVADA

SELECTED PLAN

AERIAL PHOTOGRAPHIC MAP

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

4

PLATE 5

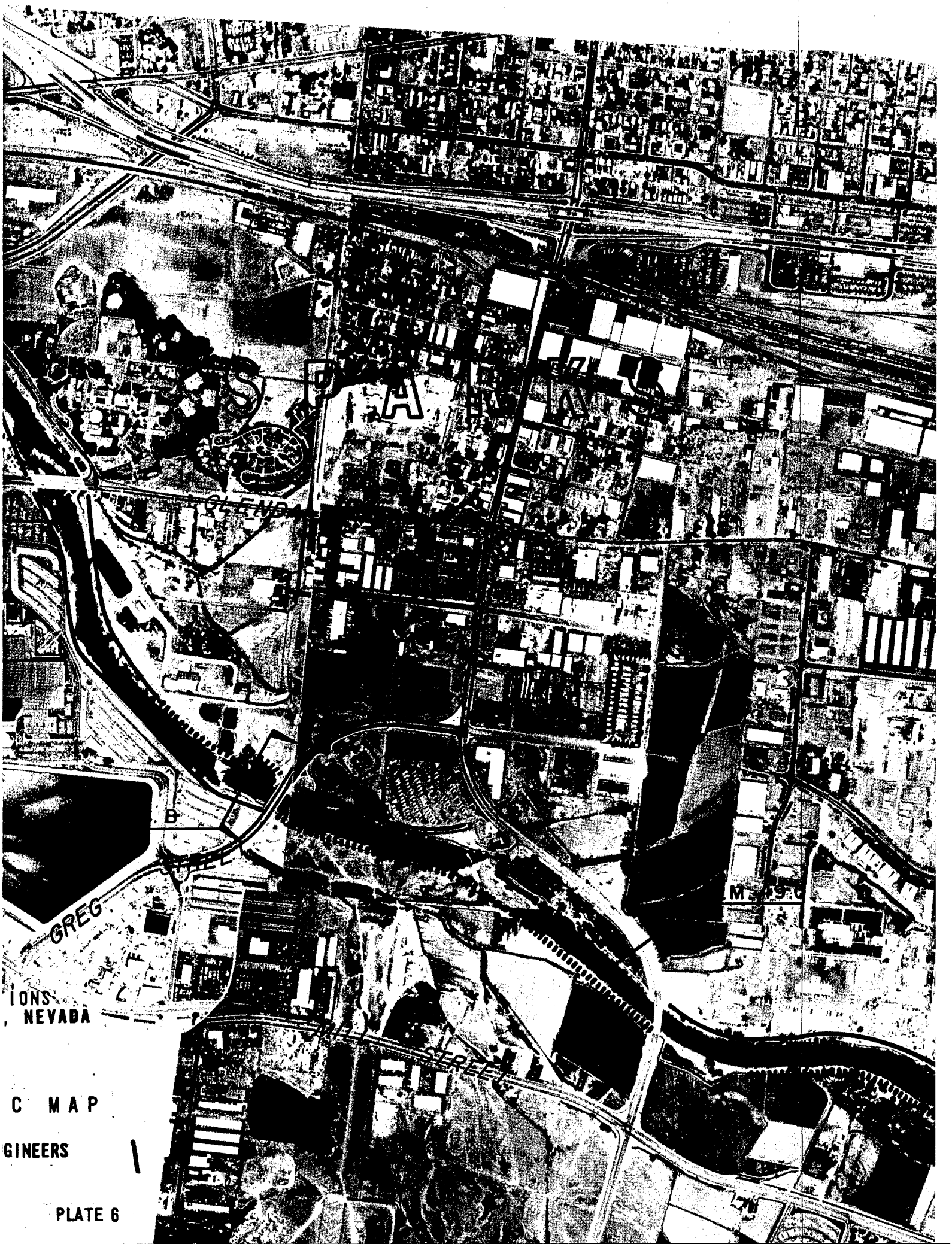
EAST
2ND
STREET
AVENUE
POMONA

TRUCKEE MEADOWS INVESTIGATIONS
RENO-SPARKS METROPOLITAN AREA, NEVADA

SELECTED PLAN
AERIAL PHOTOGRAPHIC MAP

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 6



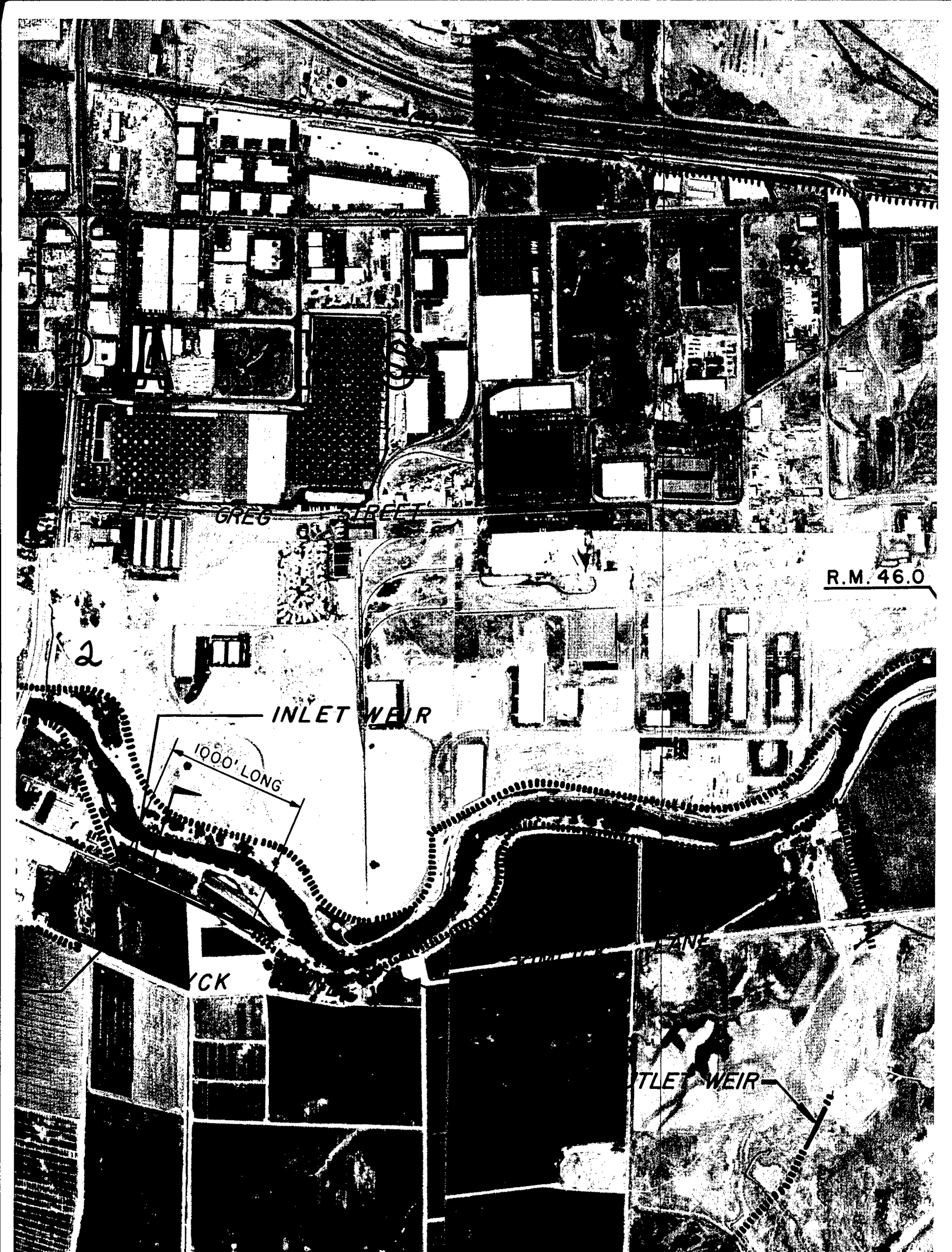
C MAP

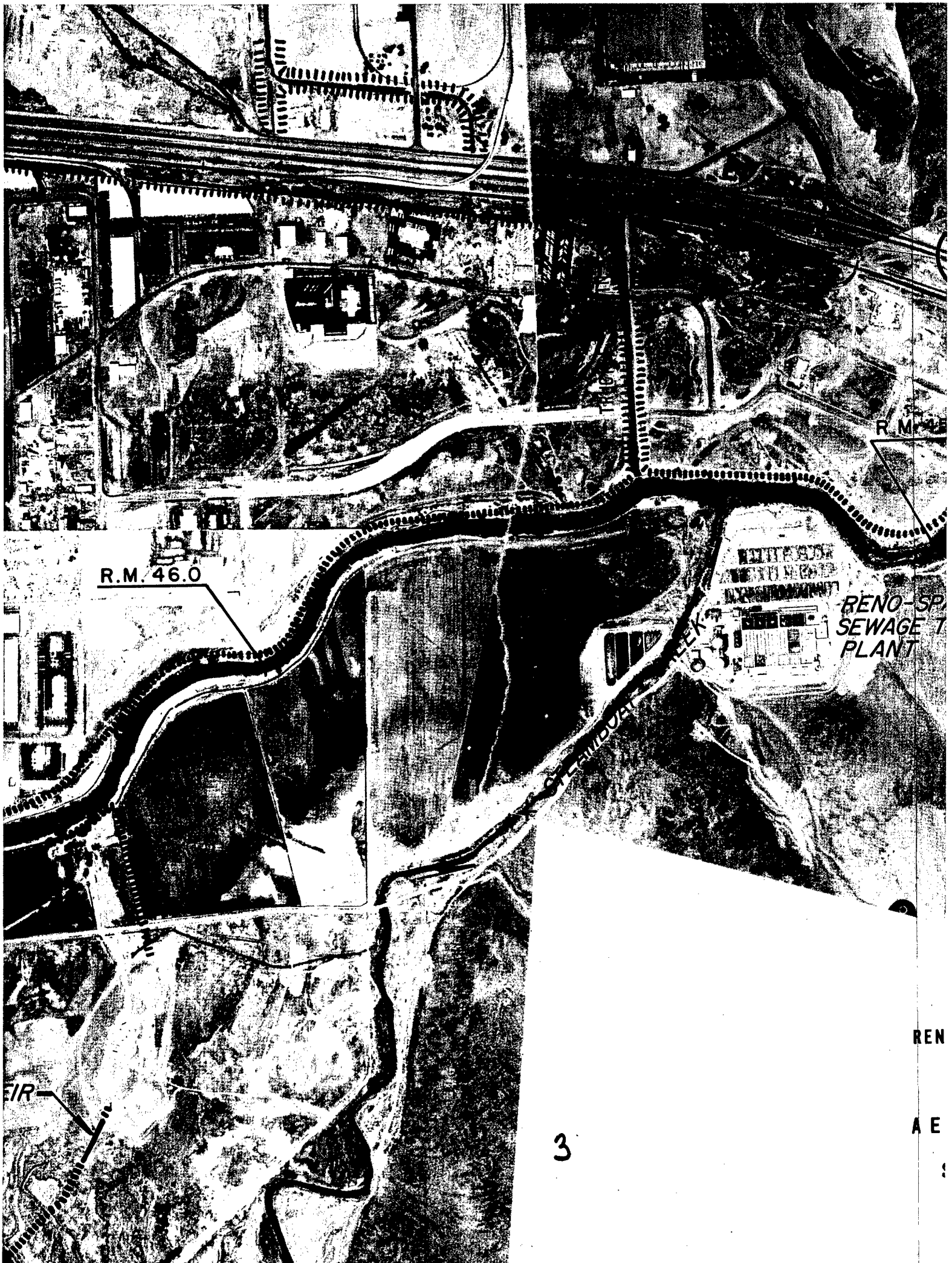
GINEERS

PLATE 6

R.M. 48.0

MILL STREET
SOUTH McCARRAN


GREG STREET
R.M. 46.0
INLET WEIR
100.0' LONG
OUTLET WEIR



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TRUCKEE MEADOWS INVESTIGATIONS
RENO-SPARKS METROPOLITAN AREA, NEVADA

SELECTED PLAN

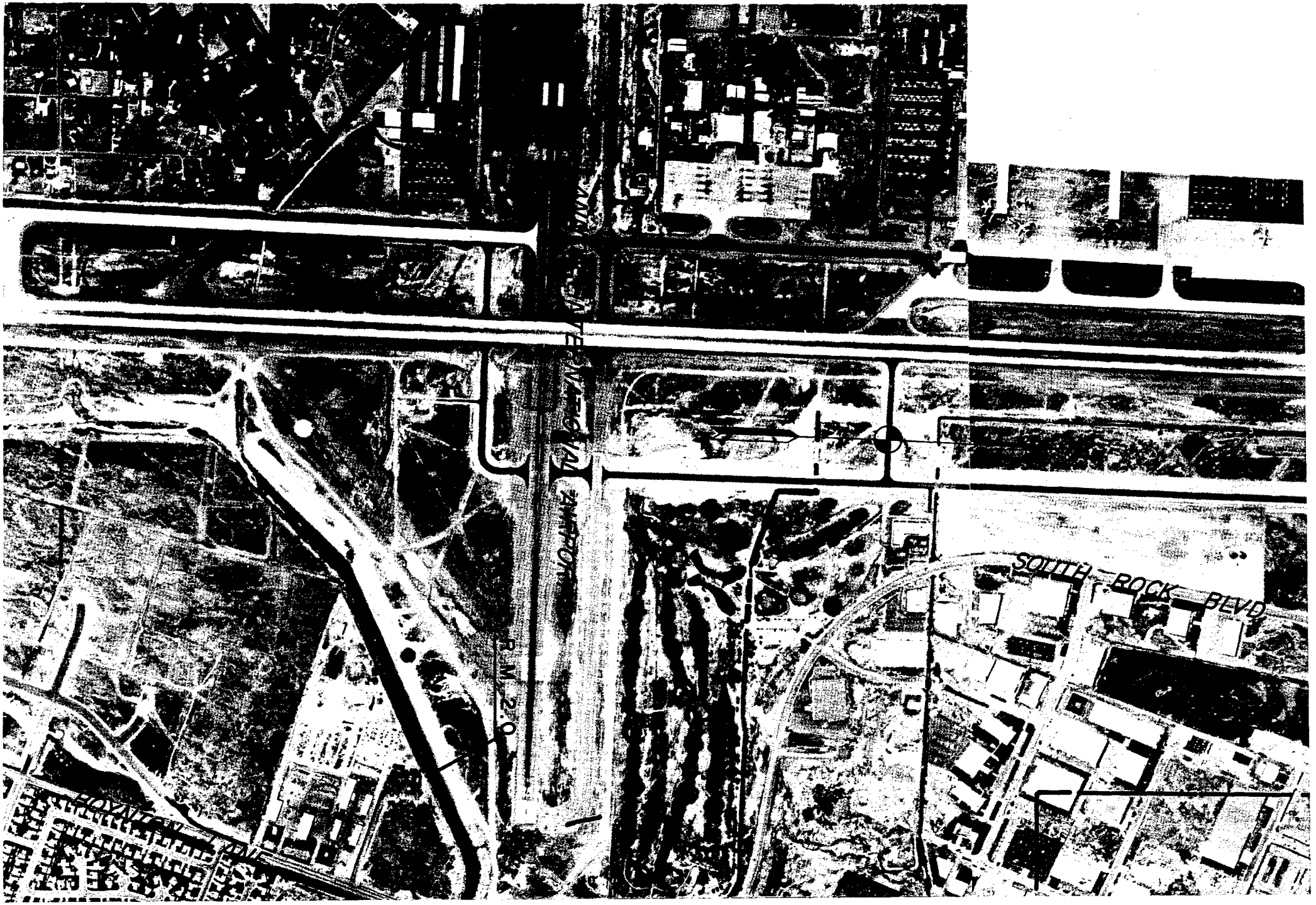
AERIAL PHOTOGRAPHIC MAP

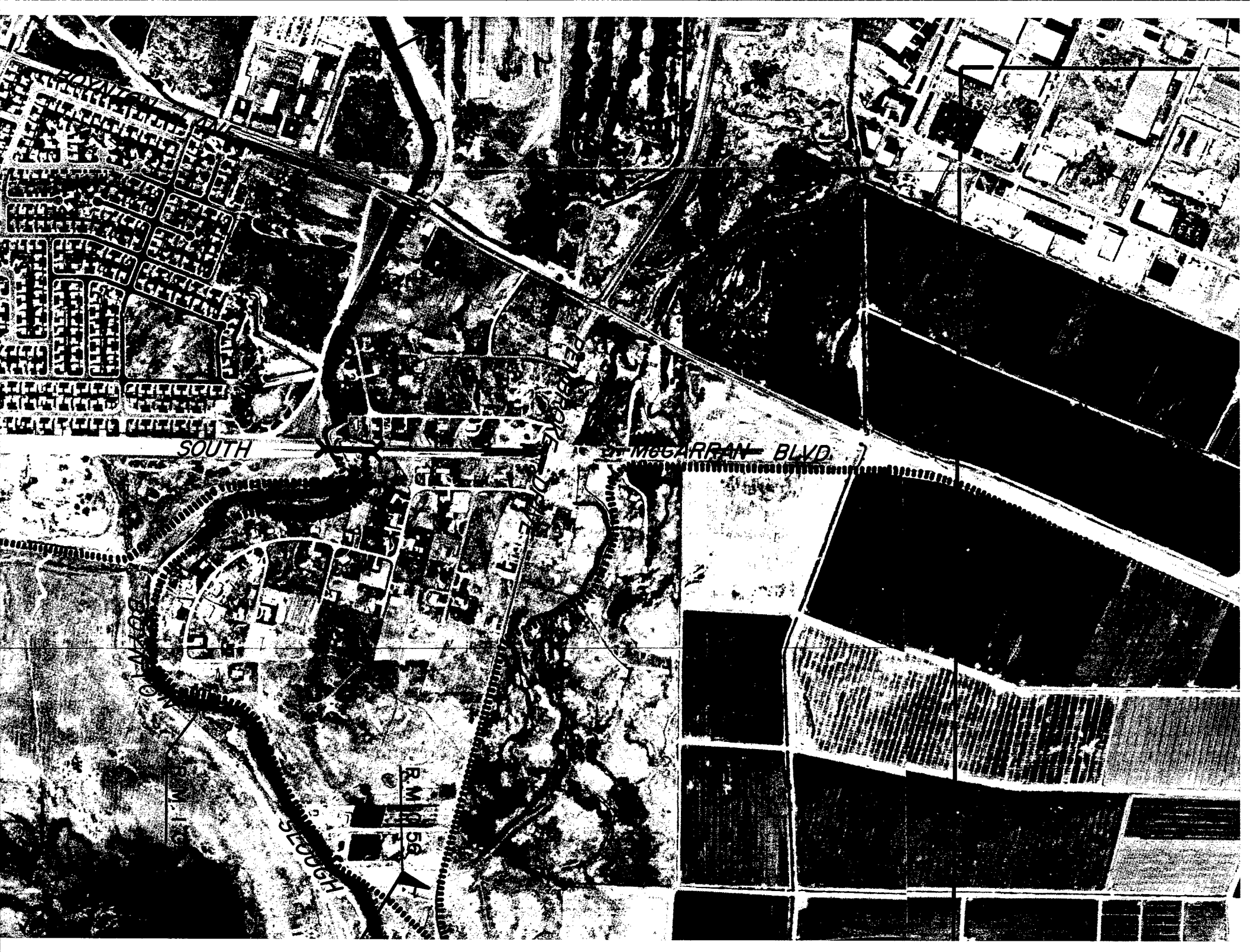
SACRAMENTO DISTRICT, CORPS OF ENGINEERS

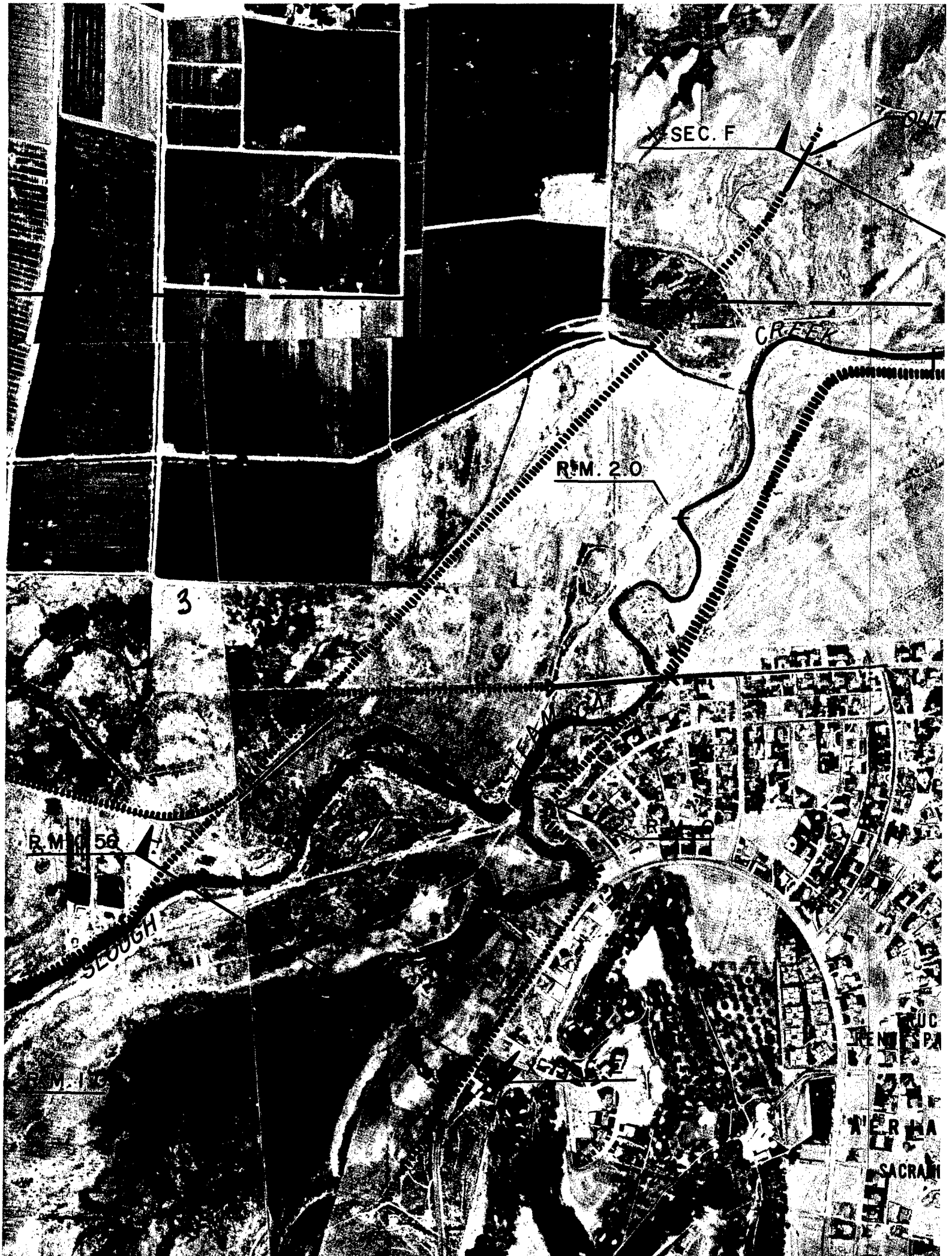
FEBRUARY 1985

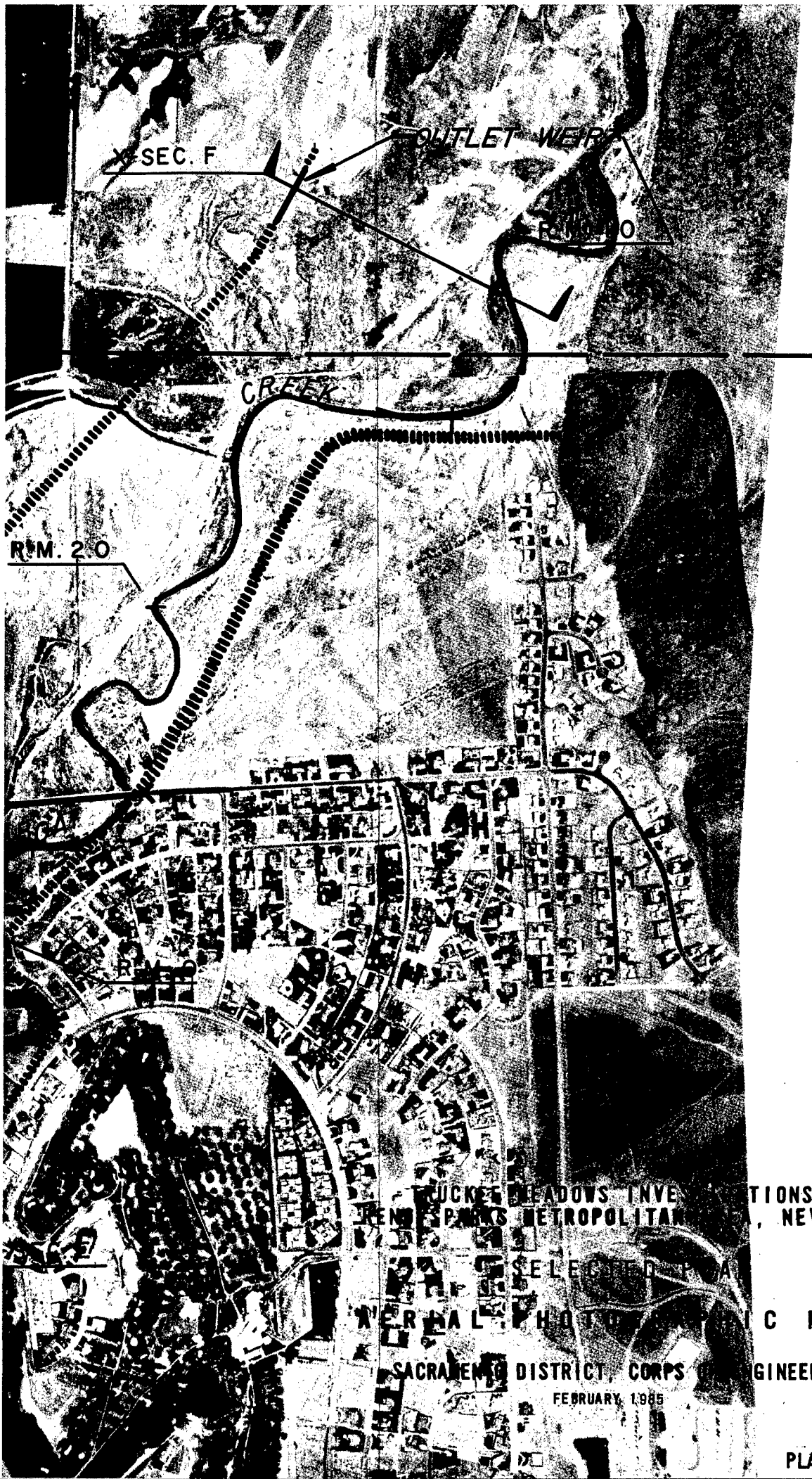
4

PLATE 7


SOUTH ROCK BLVD
BOYNTON BEACH BLVD


SOUTH
S. McCARRAN BLVD.
SLOUGH
R.M.P. 56


X-SEC. F
CREEK
R.M. 2.0
3
R.M. 5.6
SLOUGH
R.M. 1.6



TRUCKEE MEADOWS INVESTIGATIONS
RENO-SPARKS METROPOLITAN AREA, NEVADA

SELECTED PLAN

AERIAL PHOTOGRAPHIC MAP

SACRAMENTO DISTRICT, CORPS OF ENGINEERS

FEBRUARY 1985

PLATE 8

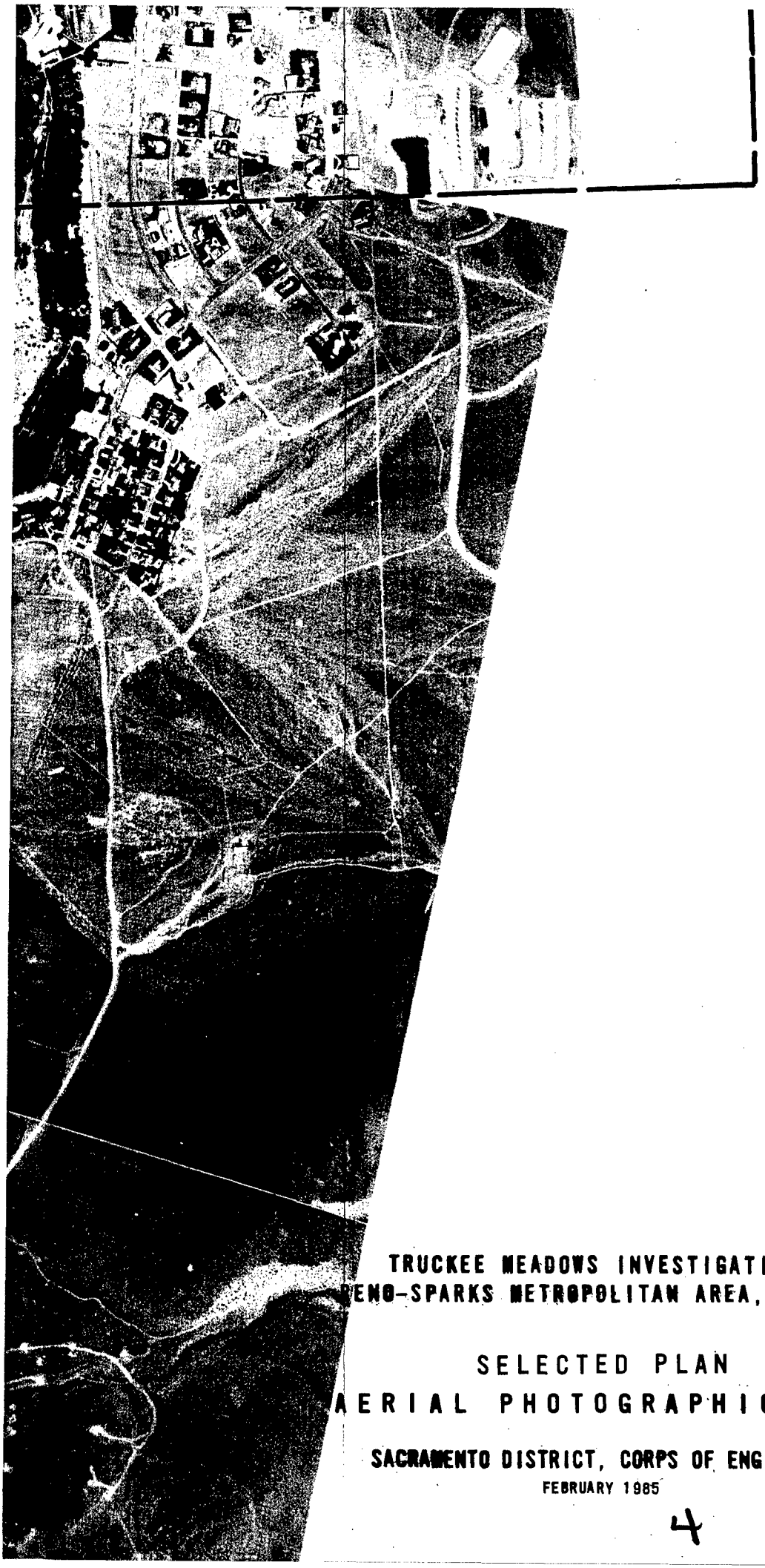
N
PEGRAM LANE
LONGLEY LANE
BOYNTON LANE
SOUTH McCARRAN BLVD

2

TR
ENG-

AER

SAC



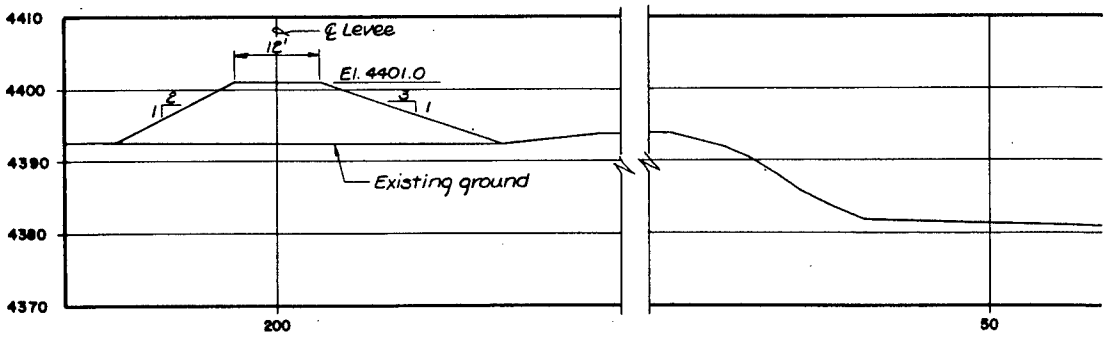
TRUCKEE MEADOWS INVESTIGATIONS
RENO-SPARKS METROPOLITAN AREA, NEVADA

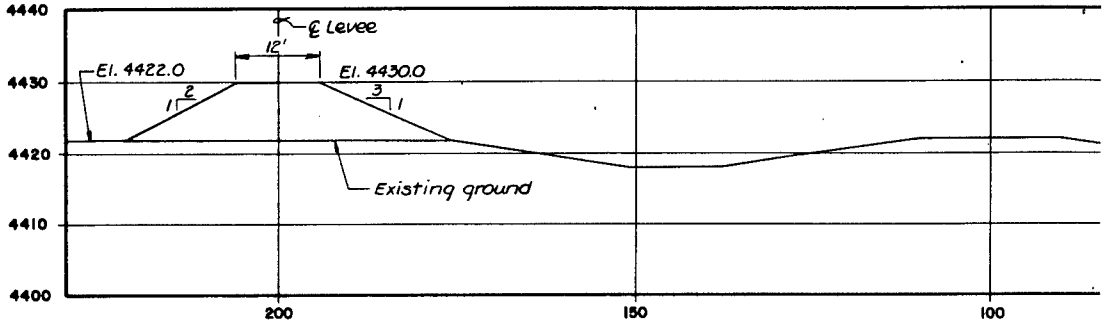
SELECTED PLAN
AERIAL PHOTOGRAPHIC MAP

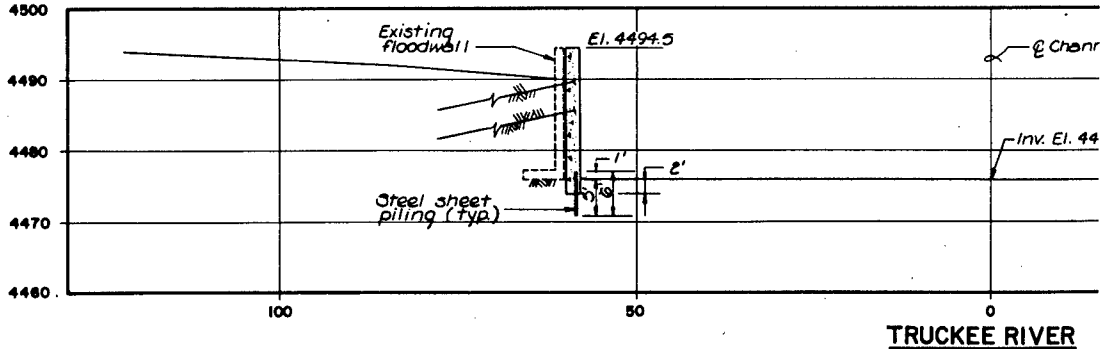
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

4

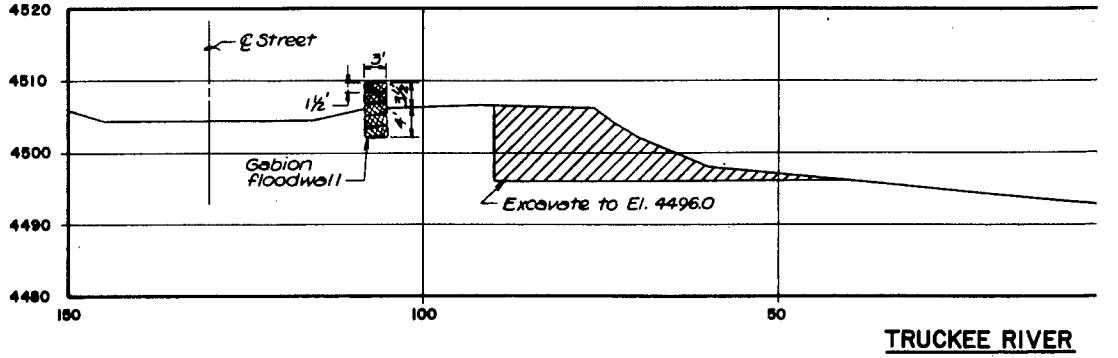
PLATE 9



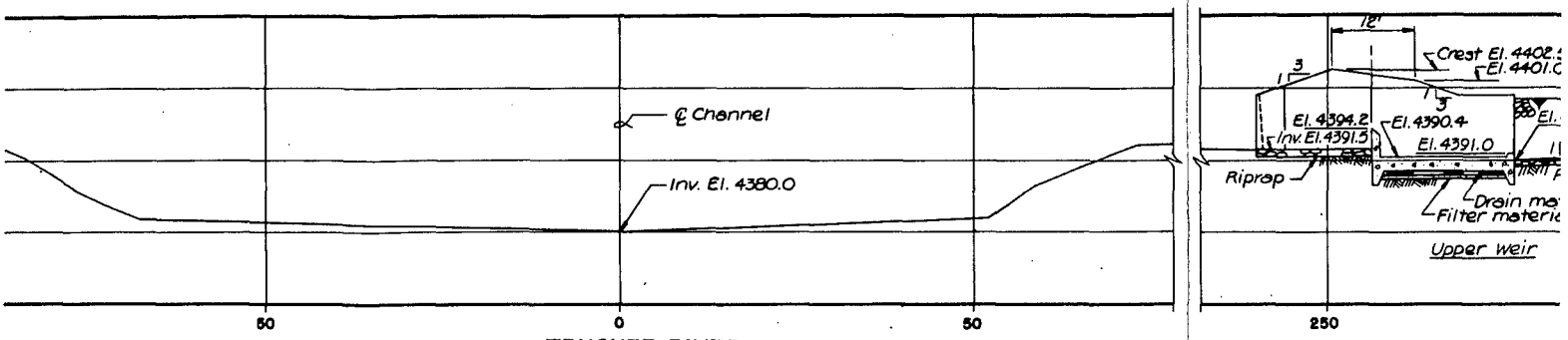




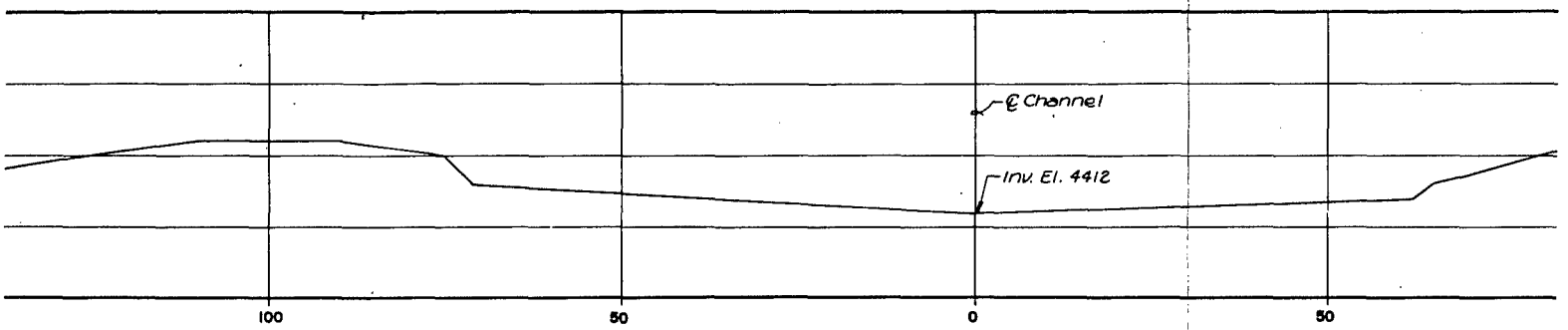
TRUCKEE RIVER
CROSS SECTION C



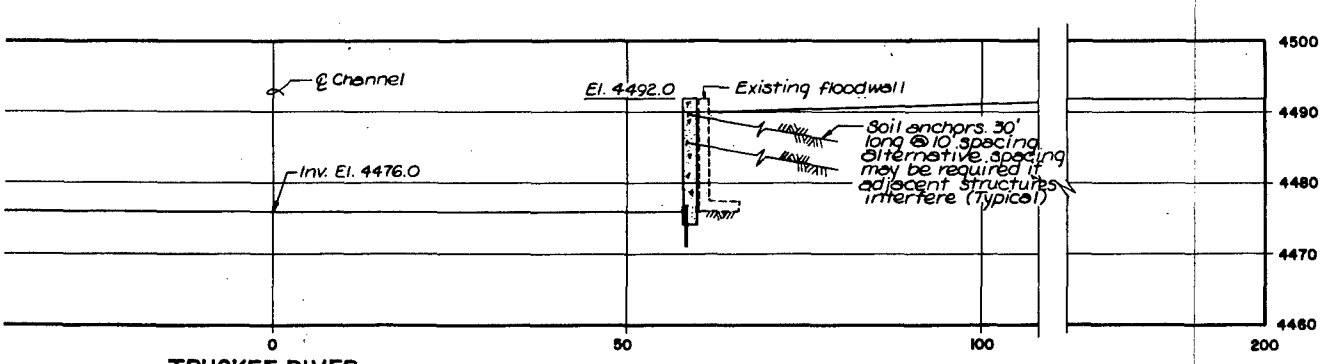
TRUCKEE RIVER
CROSS SECTION D



TRUCKEE RIVER
CROSS SECTION A

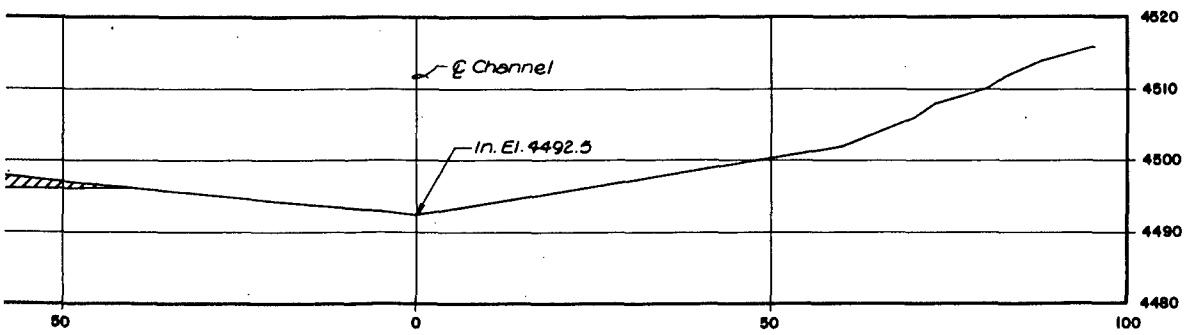


TRUCKEE RIVER
CROSS SECTION B



SCALE: 1" = 10'-0"

TRUCKEE RIVER
CROSS SECTION C

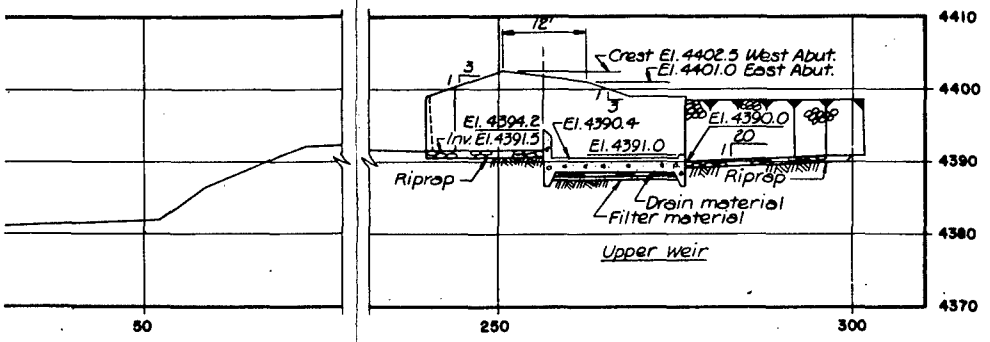


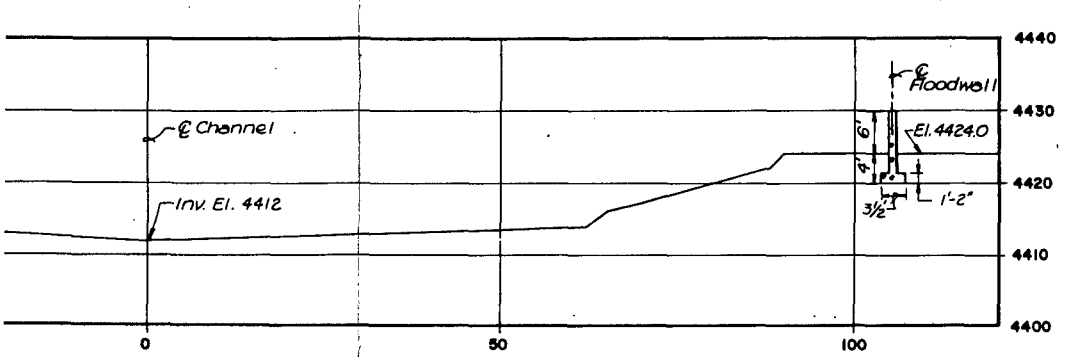
TRUCKEE RIVER
CROSS SECTION D

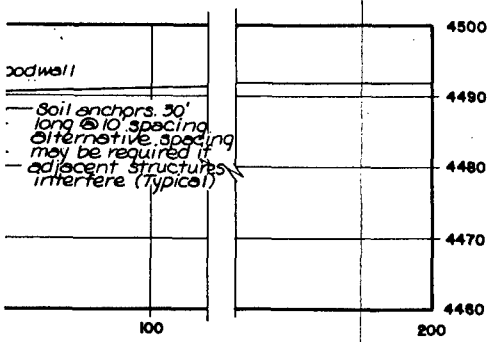
TRUCKEE MEADO
RENO-SPARKS METRO

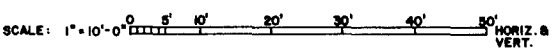
SEL
CROSS

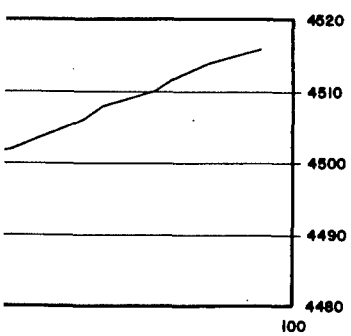
SACRAMENTO DISTRI
FEBR











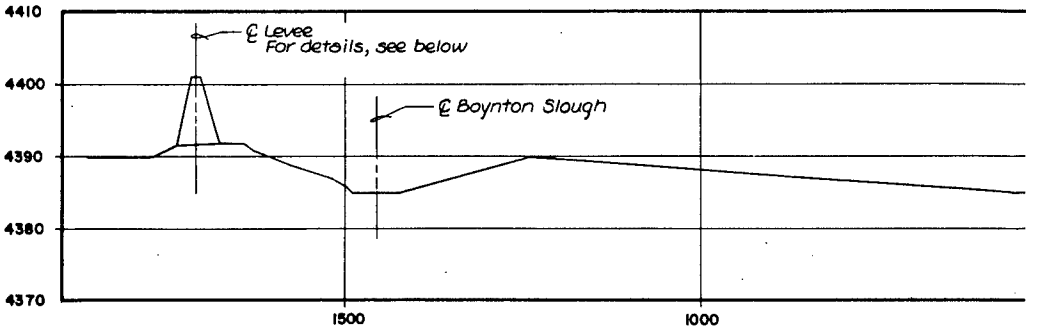
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

SELECTED CROSS SECTIONS

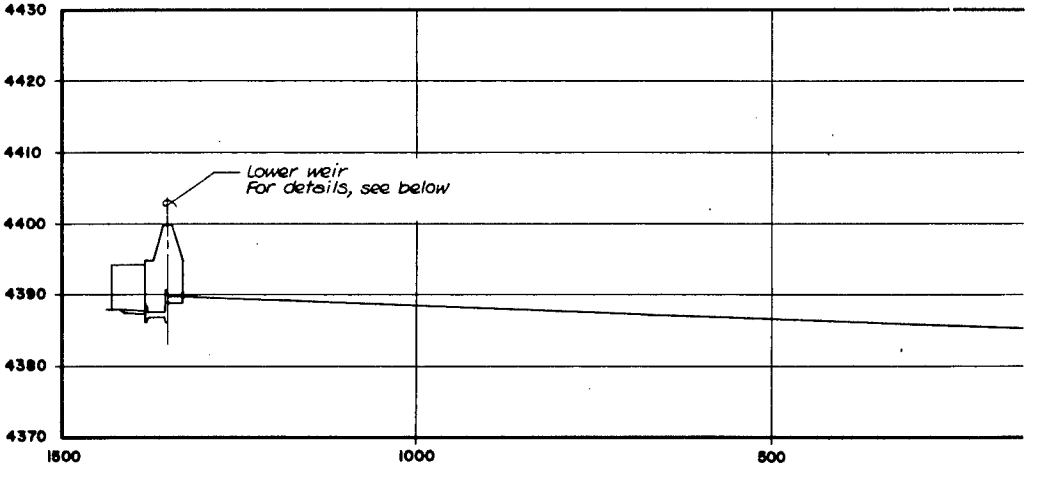
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

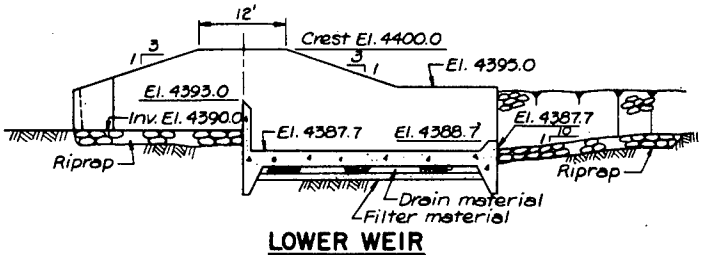
PLATE 10



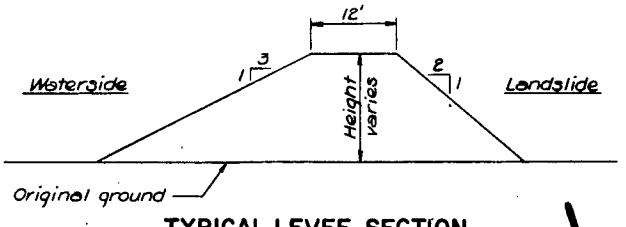
BOYNTOI



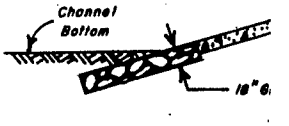
STEAMBOAT CREE
SECTION F

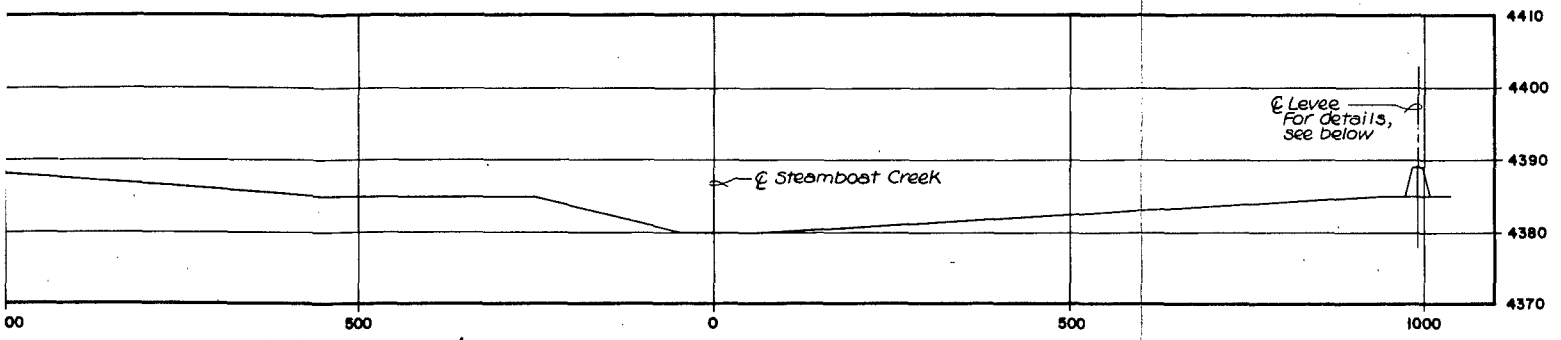


LOWER WEIR
NOT TO SCALE

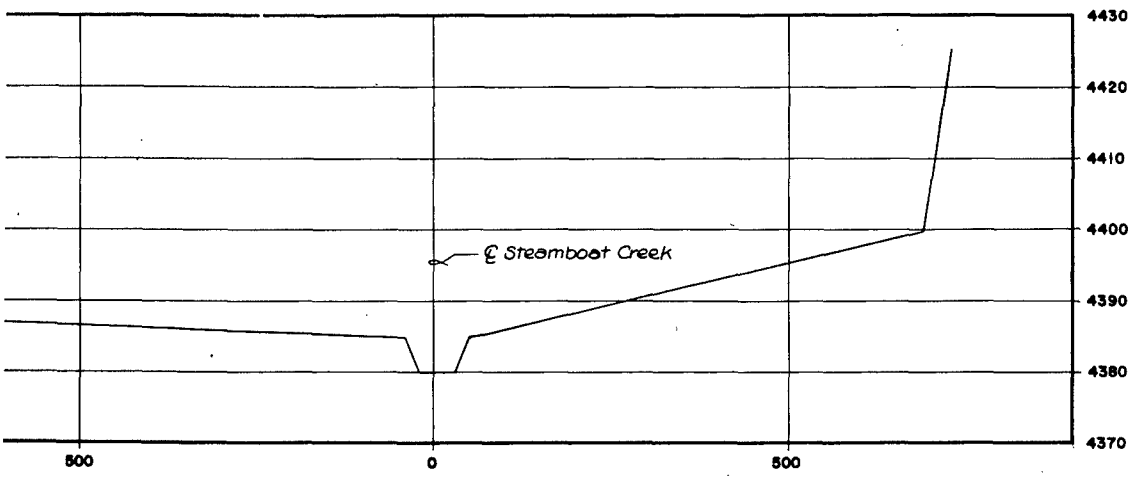


TYPICAL LEVEE SECTION
NOT TO SCALE



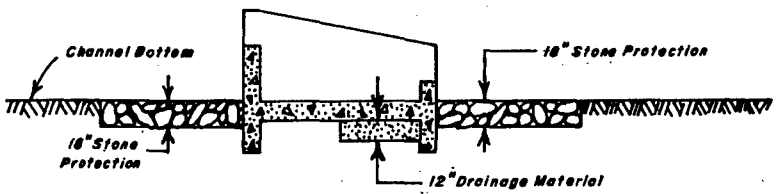


BOYNTON SLOUGH/STEAMBOAT CREEK
SECTION E

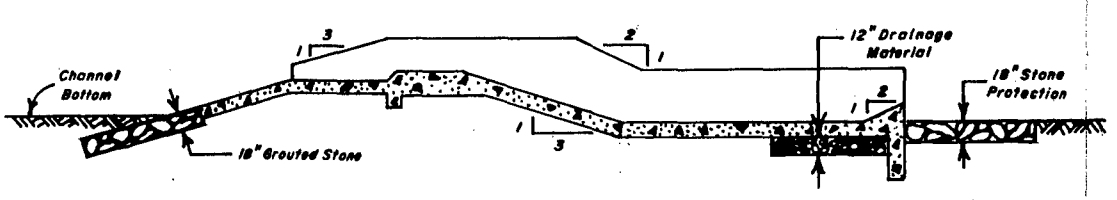


STEAMBOAT CREEK
SECTION F

SCALE: 1"= 10'-0" 0 5' 10' 20'
SCALE: 1"=100'-0" 0 50' 100' 200'



TYPICAL FLOODWALL BREAKOUT SECTION
NOT TO SCALE

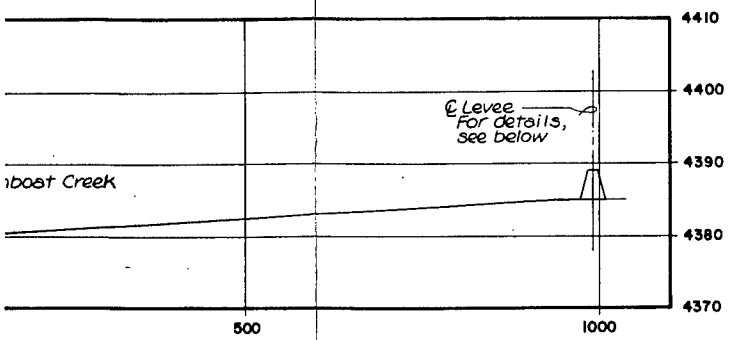


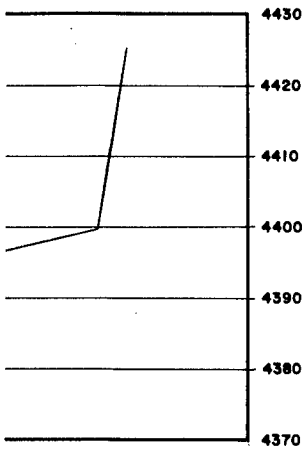
TYPICAL LEVEE BREAKOUT SECTION
NOT TO SCALE

TRUCKEE MEADO
RENO-SPARKS METROF

SELE
CROSS S

SACRAMENTO DISTRIC
FEBRU





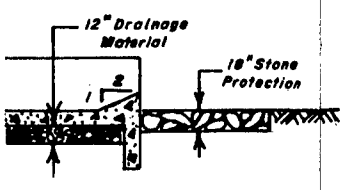
SCALE: 1"= 10'-0" 0 5' 10' 20' 30' 40' 50' VERT.

SCALE: 1"=100'-0" 0 50' 100' 200' 300' 400' 500' HORIZ.

'tone Protection

'lal

TION



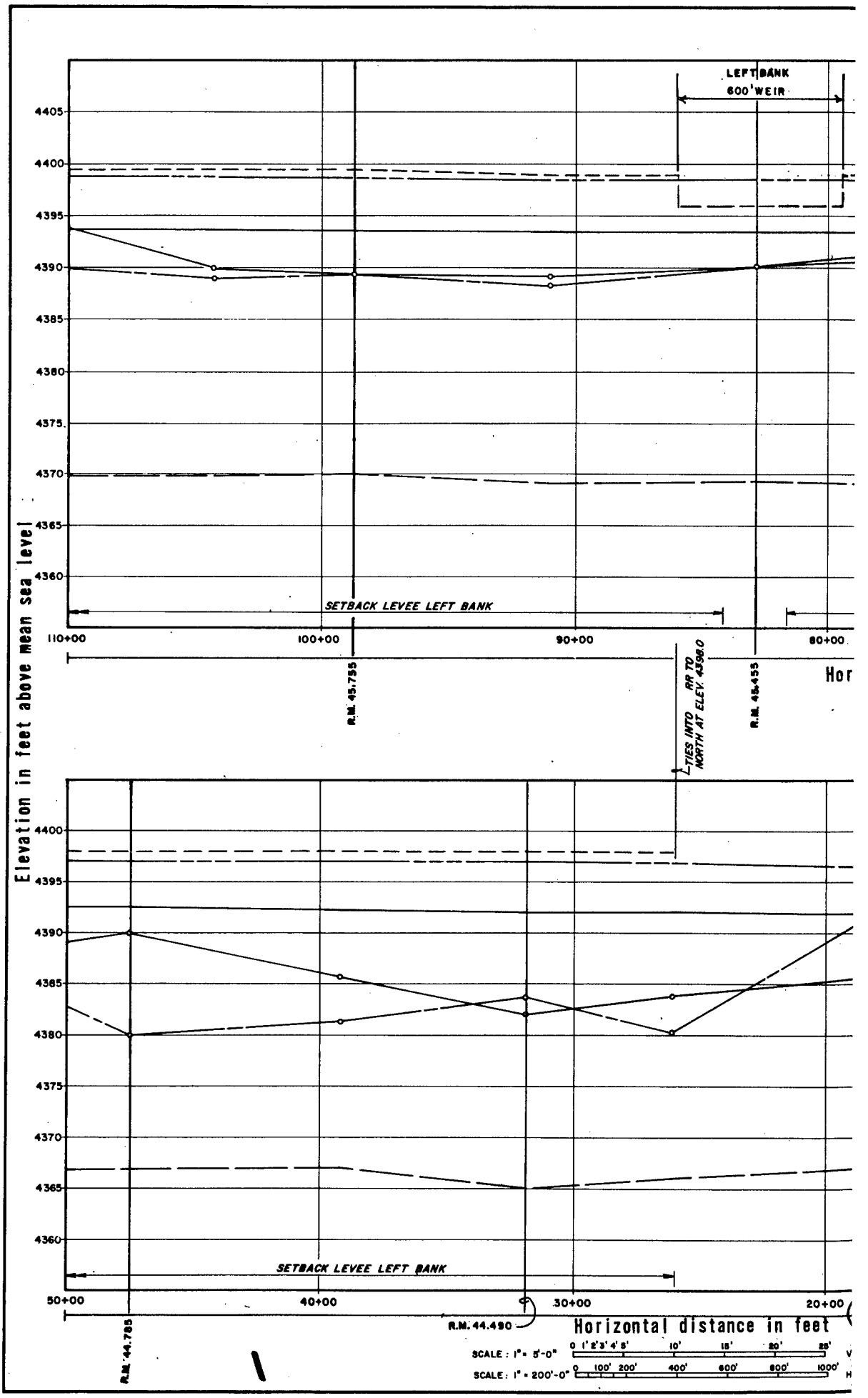
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

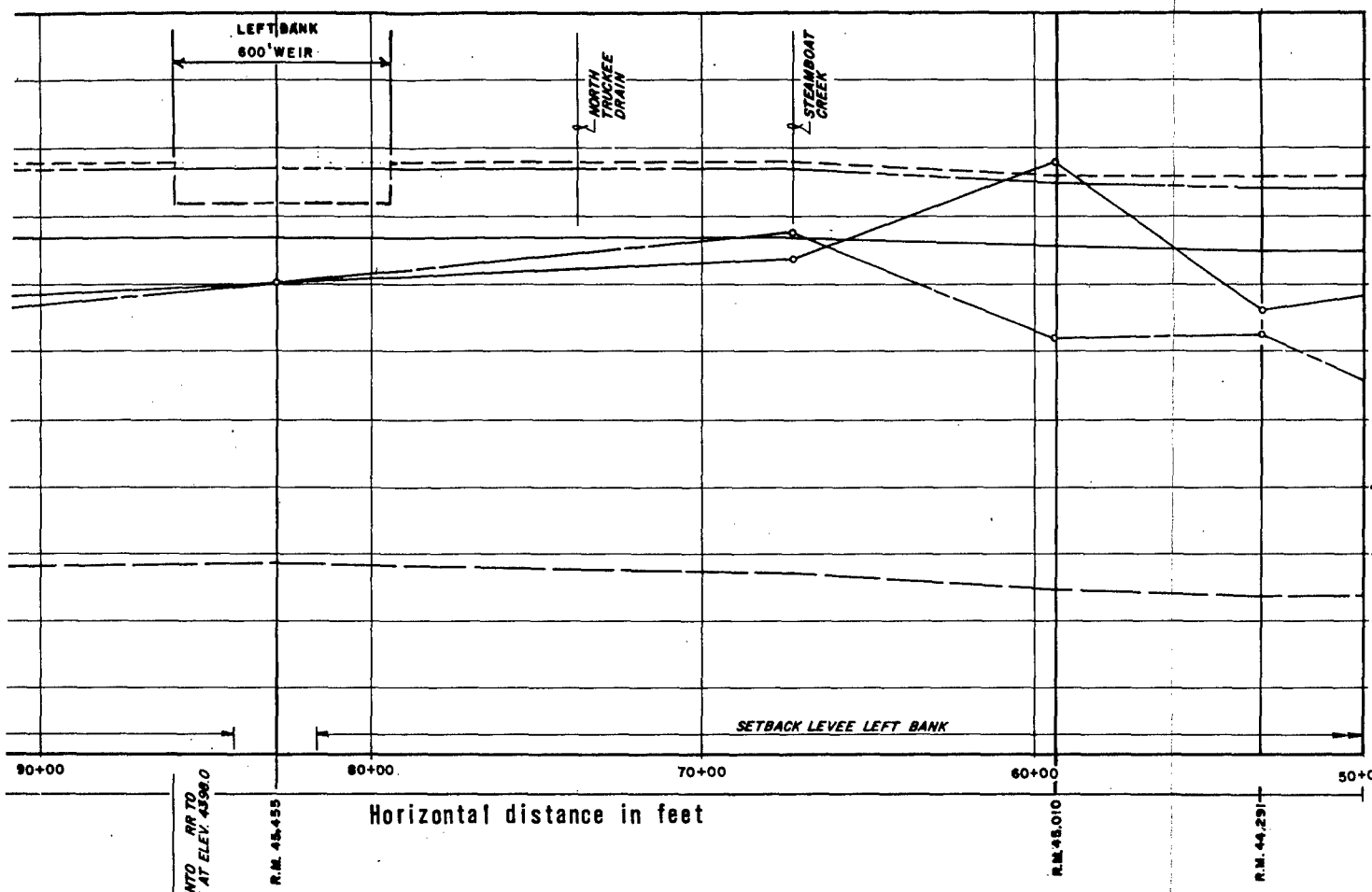
SELECTED CROSS SECTIONS

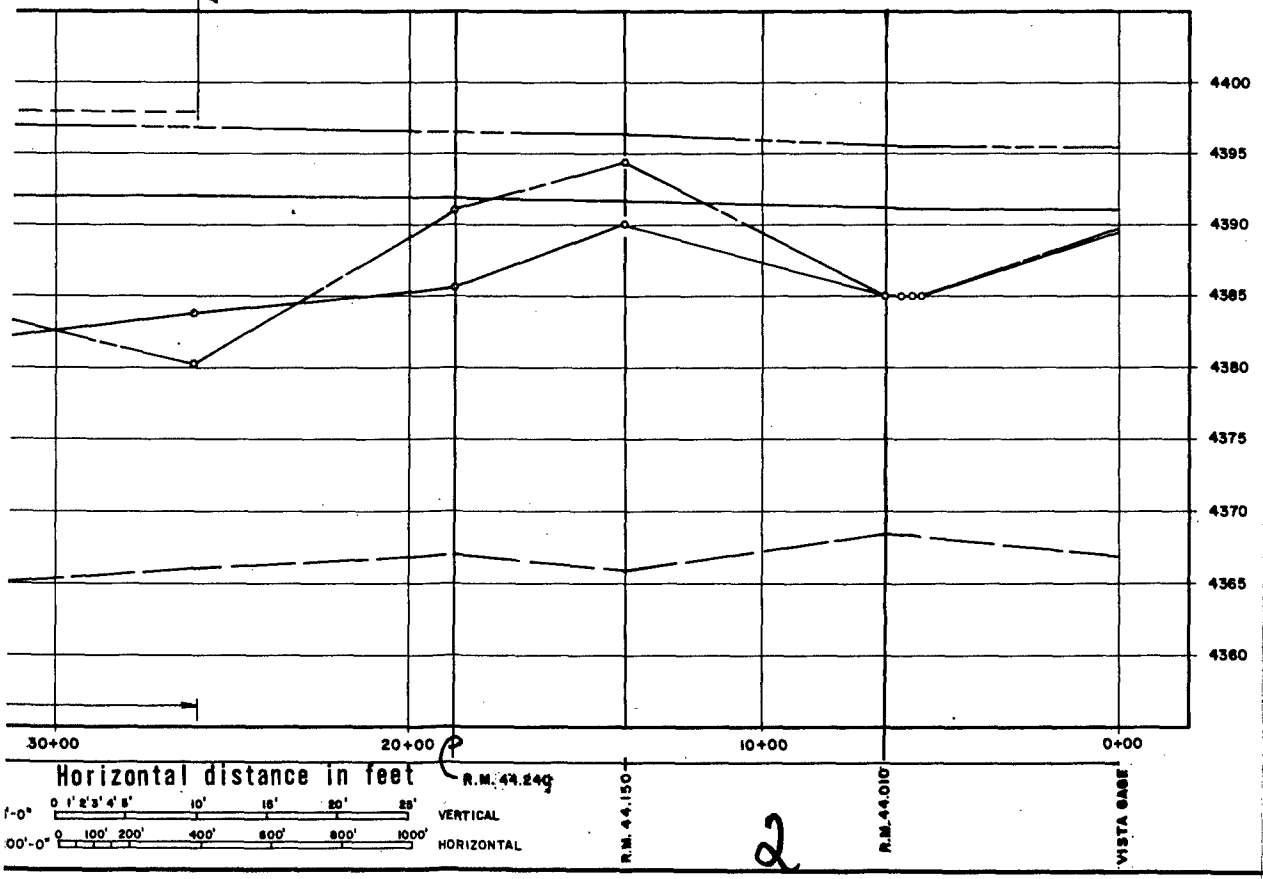
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 11


LEFT BANK
600' WEIR
4405
4400
4395
4390
4385
4380
4375
4370
4365
4360
SETBACK LEVEE LEFT BANK
110+00
100+00
90+00
80+00
R.M. 45.755
R.M. 45.455
TIES INTO RR TO NORTH AT ELEV. 4398.0
Hor
Elevation in feet above mean sea level
4400
4395
4390
4385
4380
4375
4370
4365
4360
SETBACK LEVEE LEFT BANK
50+00
40+00
30+00
20+00
R.M. 44.785
R.M. 44.490
Horizontal distance in feet
SCALE : 1" = 5'-0"
0 1' 2' 3' 4' 5' 10' 15' 20' 25'
SCALE : 1" = 200'-0"
0 100' 200' 400' 600' 800' 1000'





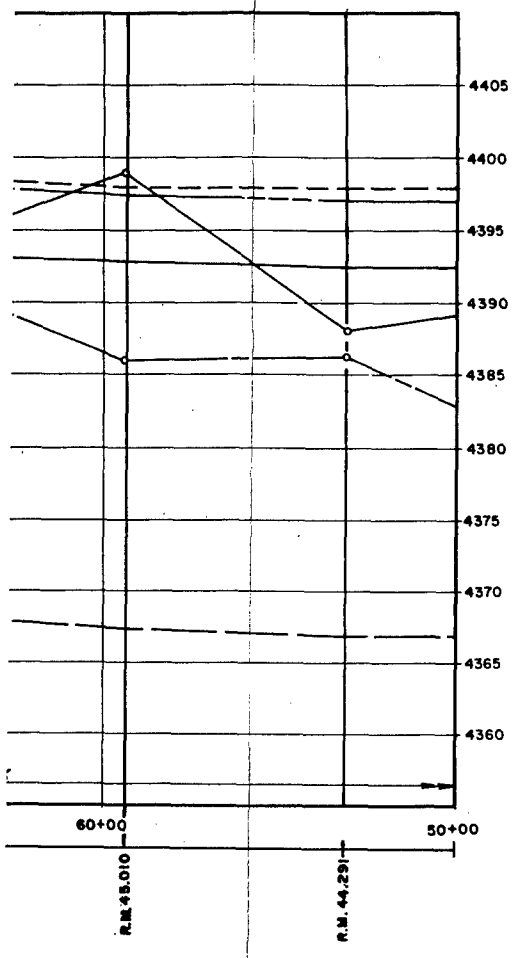
LEGE

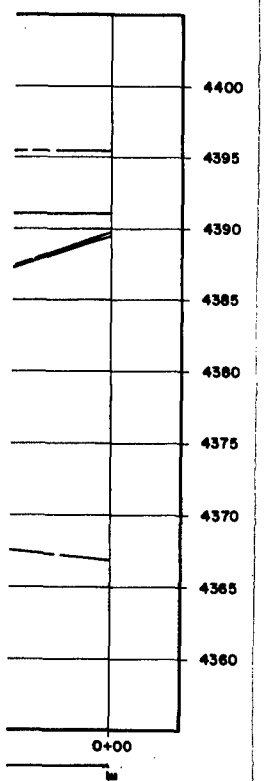
44.010

TRUCKEE
RENO-SPARK

STA. C

SACRAMENTO





LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS/LEFT BANK
- IMPROVEMENTS/RIGHT BANK
- IMPROVEMENTS/LEFT & RIGHT BANKS
- 44.010 — RIVER MILE (R.M. BEGINS AT PYRAMID LAKE).

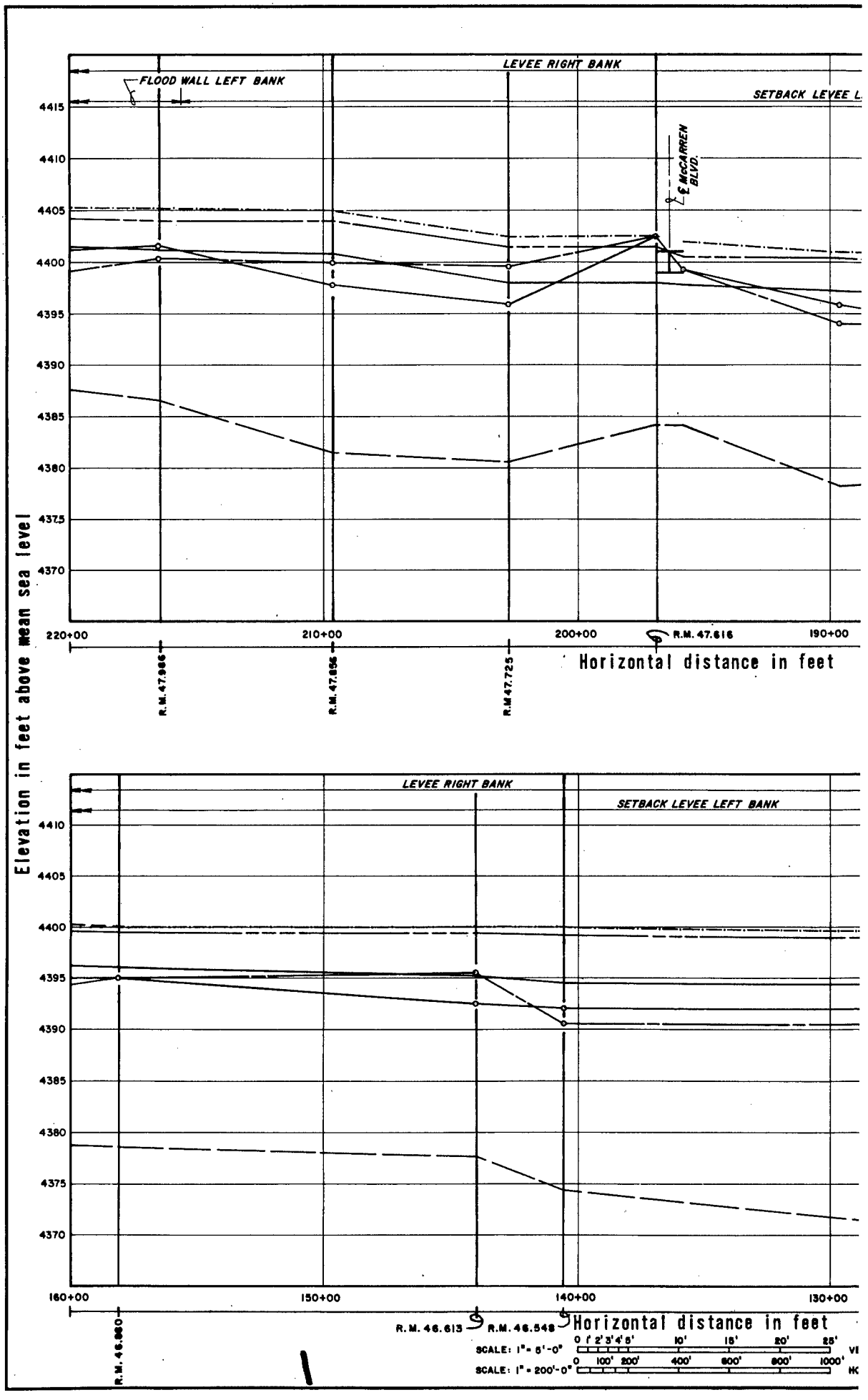
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

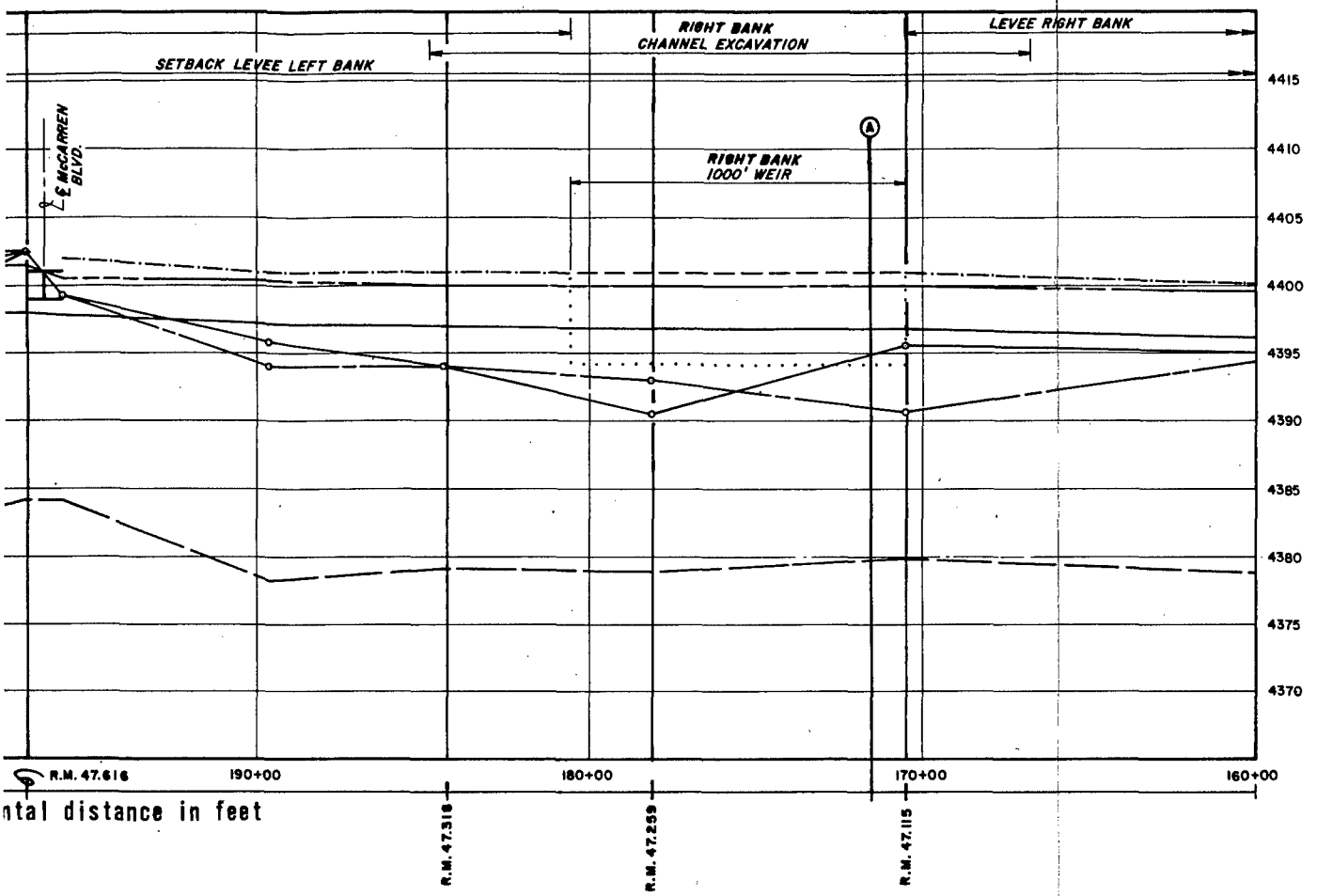
TRUCKEE RIVER
PROFILE
STA. 0+00 to STA. 110+00

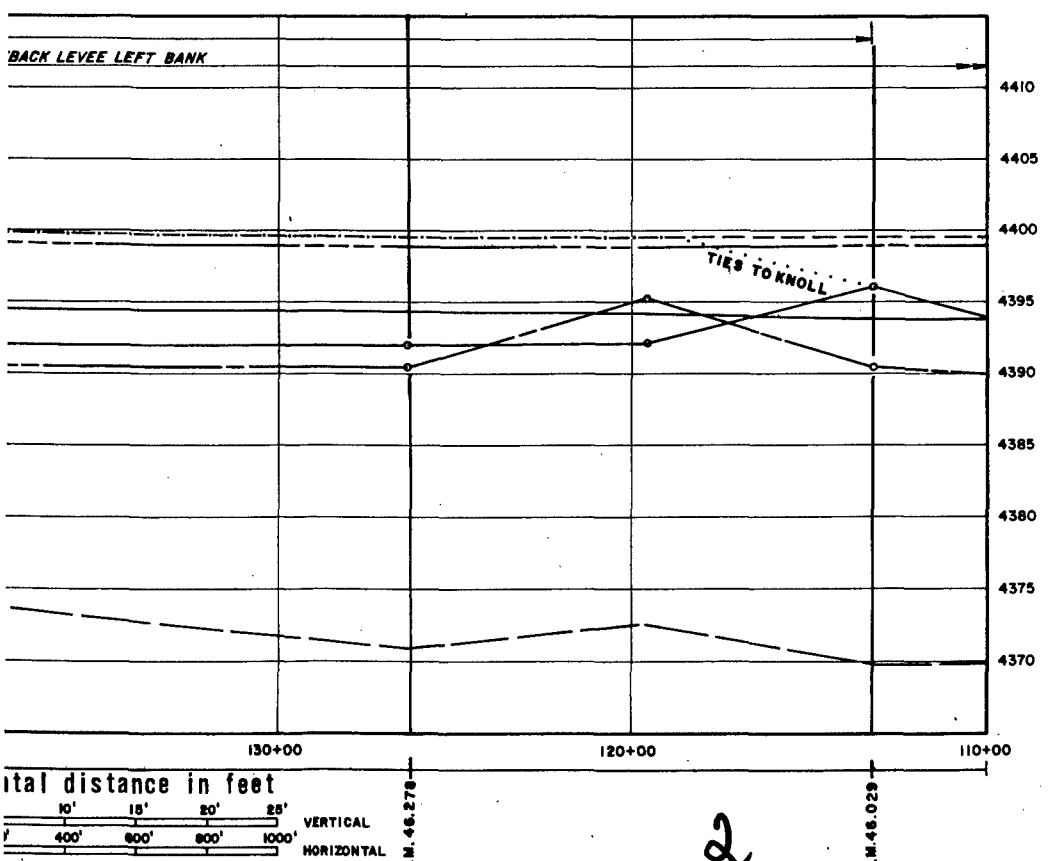
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 12


FLOOD WALL LEFT BANK
LEVEE RIGHT BANK
SETBACK LEVEE L
℄ McCARREN BLVD.
4415
4410
4405
4400
4395
4390
4385
4380
4375
4370
220+00
210+00
200+00
R.M. 47.616
190+00
R.M. 47.986
R.M. 47.856
R.M 47.725
Horizontal distance in feet
Elevation in feet above mean sea level
LEVEE RIGHT BANK
SETBACK LEVEE LEFT BANK
4410
4405
4400
4395
4390
4385
4380
4375
4370
160+00
150+00
140+00
130+00
R.M. 46.680
R.M. 46.613
R.M. 46.548
Horizontal distance in feet
SCALE: 1" = 5'-0"
0 1' 2' 3' 4' 5' 10' 15' 20' 25'
SCALE: 1" = 200'-0"
0 100' 200' 400' 600' 800' 1000'





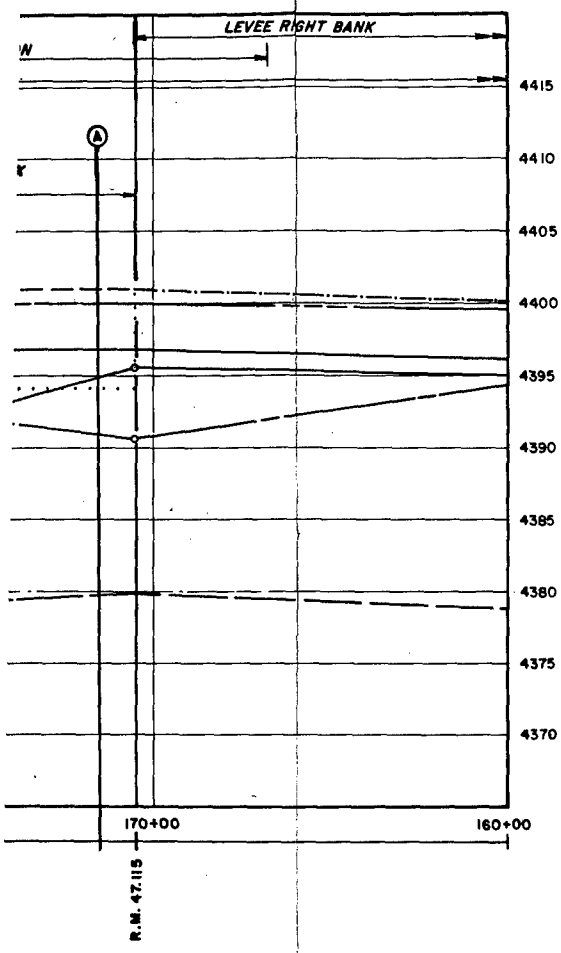
LEGEND

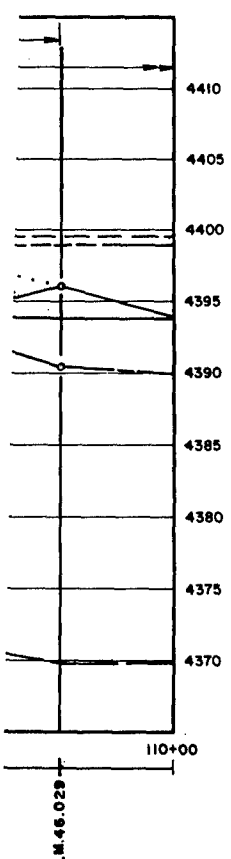
- 100 YEAR F
- STANDARD I
- EXISTING L
- EXISTING F
- CHANNEL IN
- IMPROVEME
- IMPROVEME
- IMPROVEME
- A — CROSS SEC

TRUCKEE MEADOWS
RENO-SPARKS METROPOL

TRUCKEE
PROFI
STA. 110+00 to 9

SACRAMENTO DISTRICT, C
FEBRUARY





LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS/LEFT BANK
- IMPROVEMENTS/RIGHT BANK
- IMPROVEMENTS/LEFT & RIGHT BANKS
- CROSS SECTION

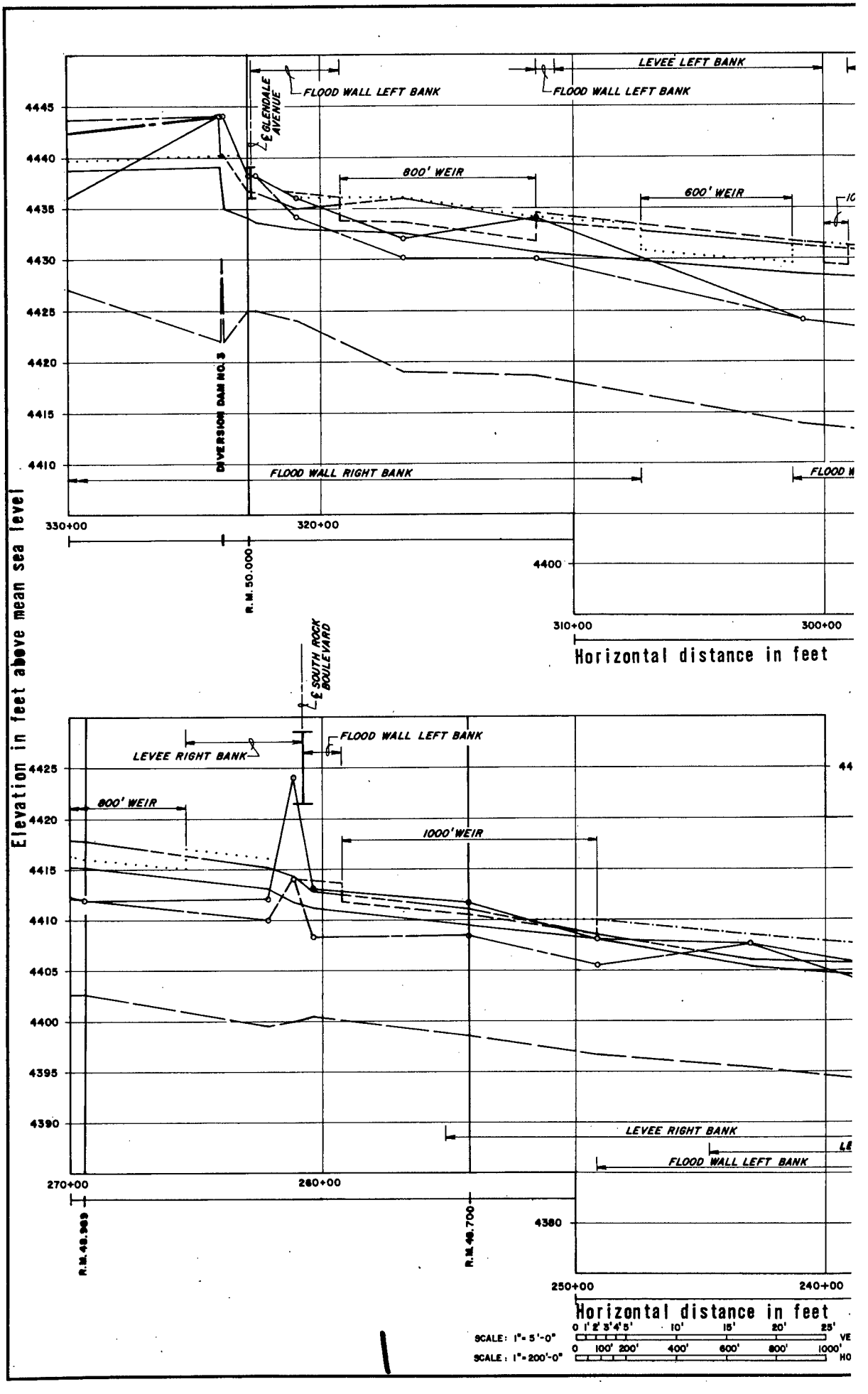
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

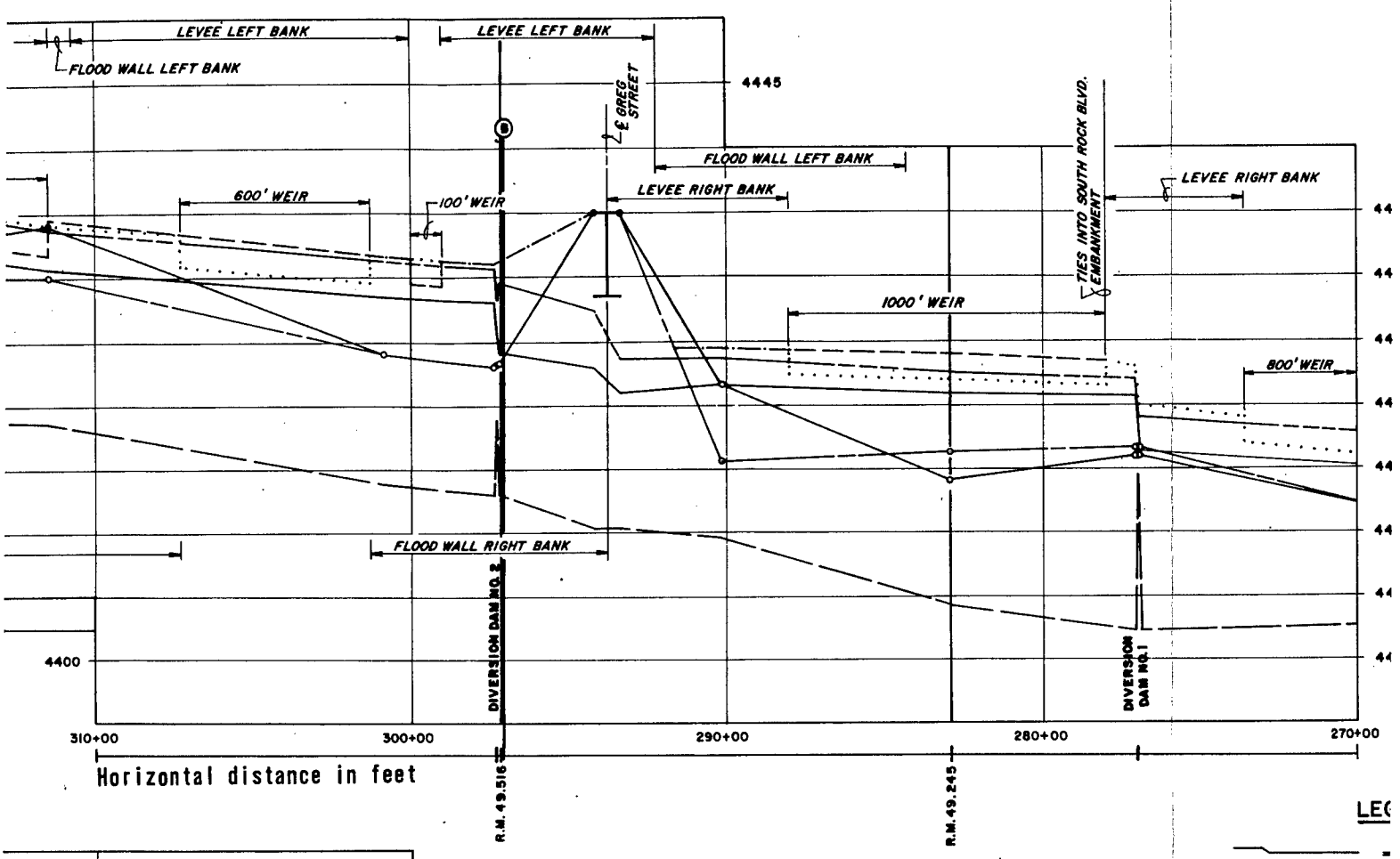
TRUCKEE RIVER
PROFILE
STA. 110+00 to STA. 220+00

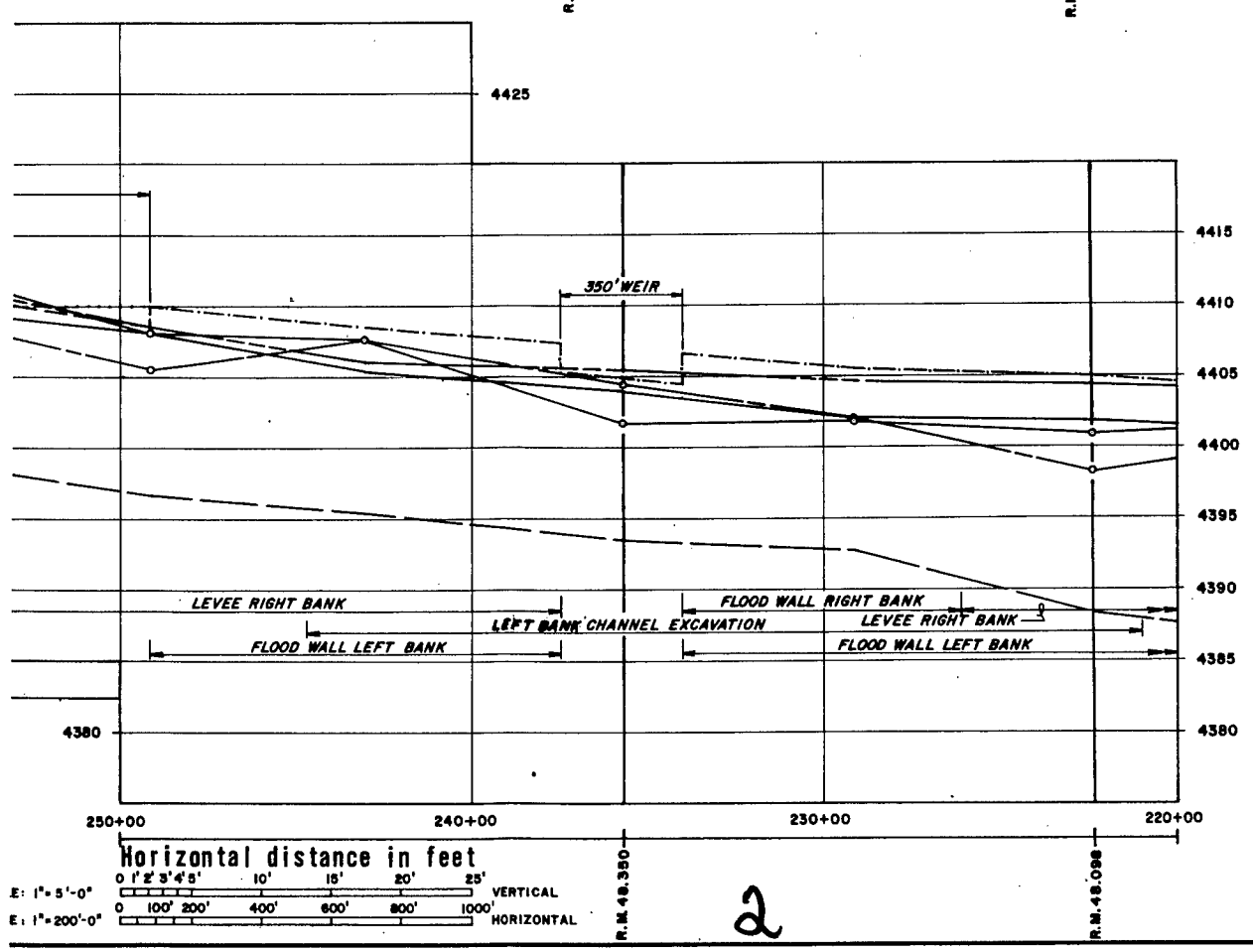
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

3

PLATE 13


LEVEE LEFT BANK
FLOOD WALL LEFT BANK
FLOOD WALL LEFT BANK
℄ GLENDALE AVENUE
800' WEIR
600' WEIR
DIVERSION DAM NO. 3
FLOOD WALL RIGHT BANK
4445
4440
4435
4430
4425
4420
4415
4410
4400
330+00
320+00
310+00
300+00
R.M. 50.000
Elevation in feet above mean sea level
Horizontal distance in feet
℄ SOUTH ROCK BOULEVARD
LEVEE RIGHT BANK
FLOOD WALL LEFT BANK
800' WEIR
1000' WEIR
4425
4420
4415
4410
4405
4400
4395
4390
4380
270+00
260+00
250+00
240+00
R.M. 48.959
R.M. 48.700
LEVEE RIGHT BANK
FLOOD WALL LEFT BANK
Horizontal distance in feet
SCALE: 1"= 5'-0"
SCALE: 1"=200'-0"

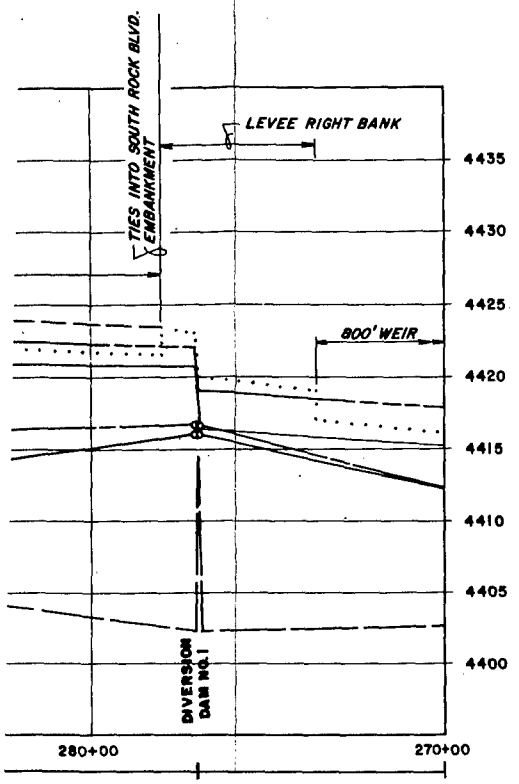




LEG

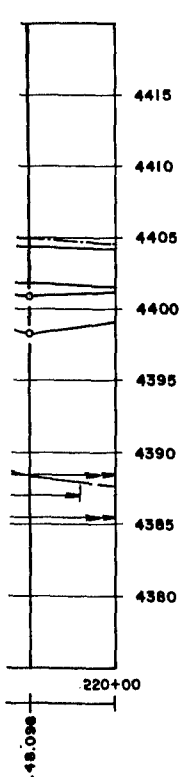
TRU
RENO-SI

SACRAM



LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS/LEFT BANK
- IMPROVEMENTS/RIGHT BANK
- IMPROVEMENTS/LEFT & RIGHT BANK
- (B) CROSS SECTION



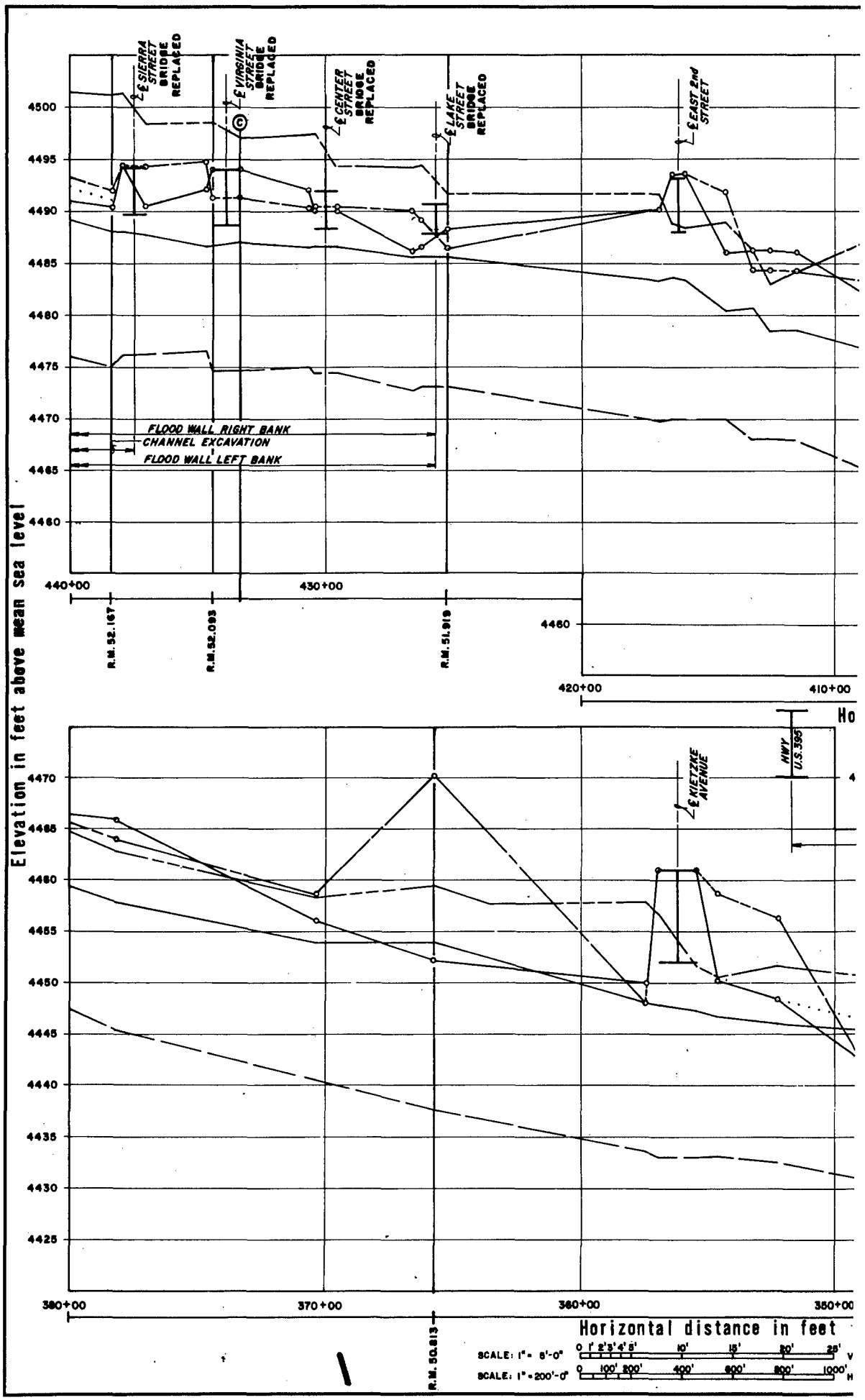
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

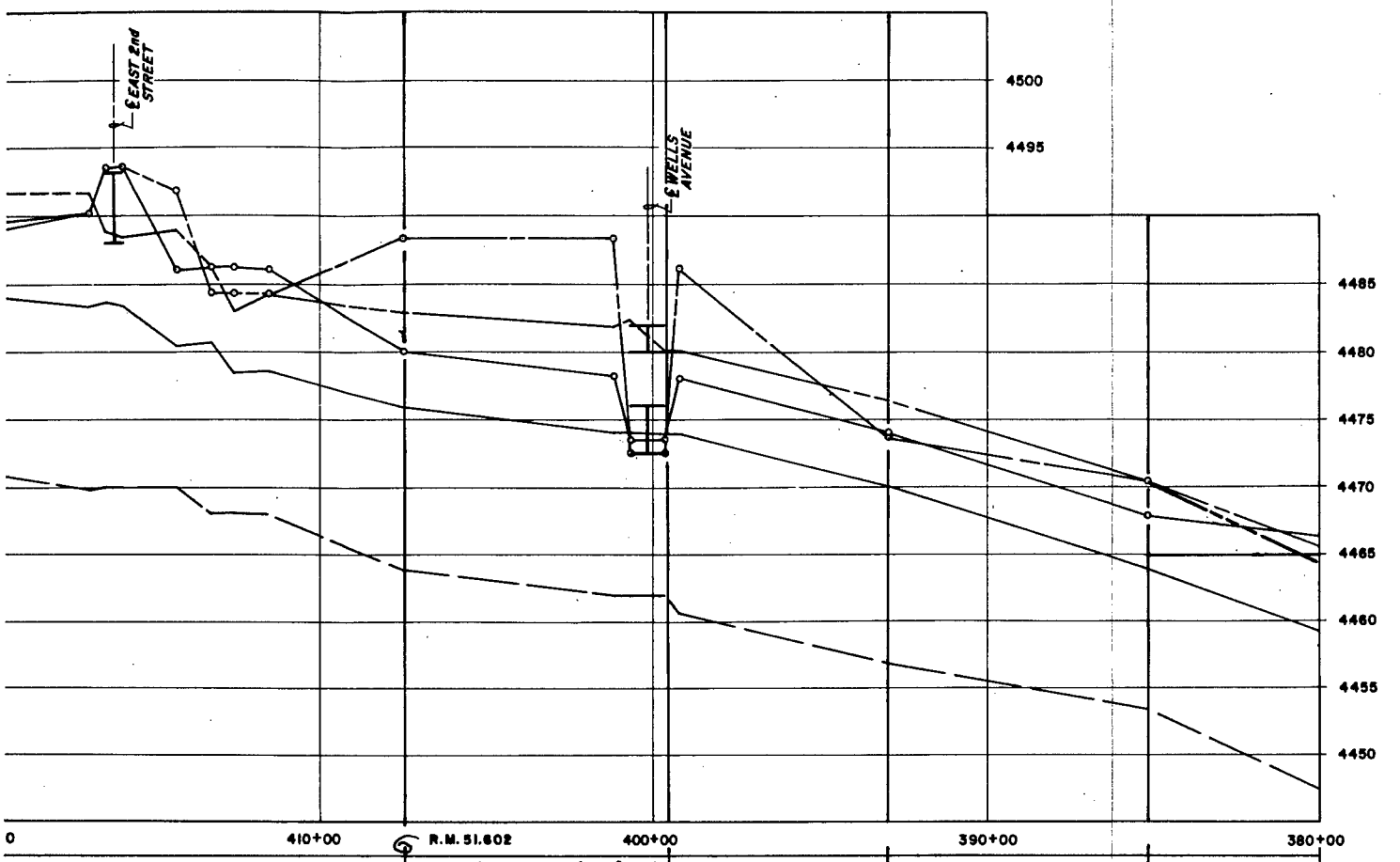
TRUCKEE RIVER
PROFILE
STA. 220+00 to STA. 330+00

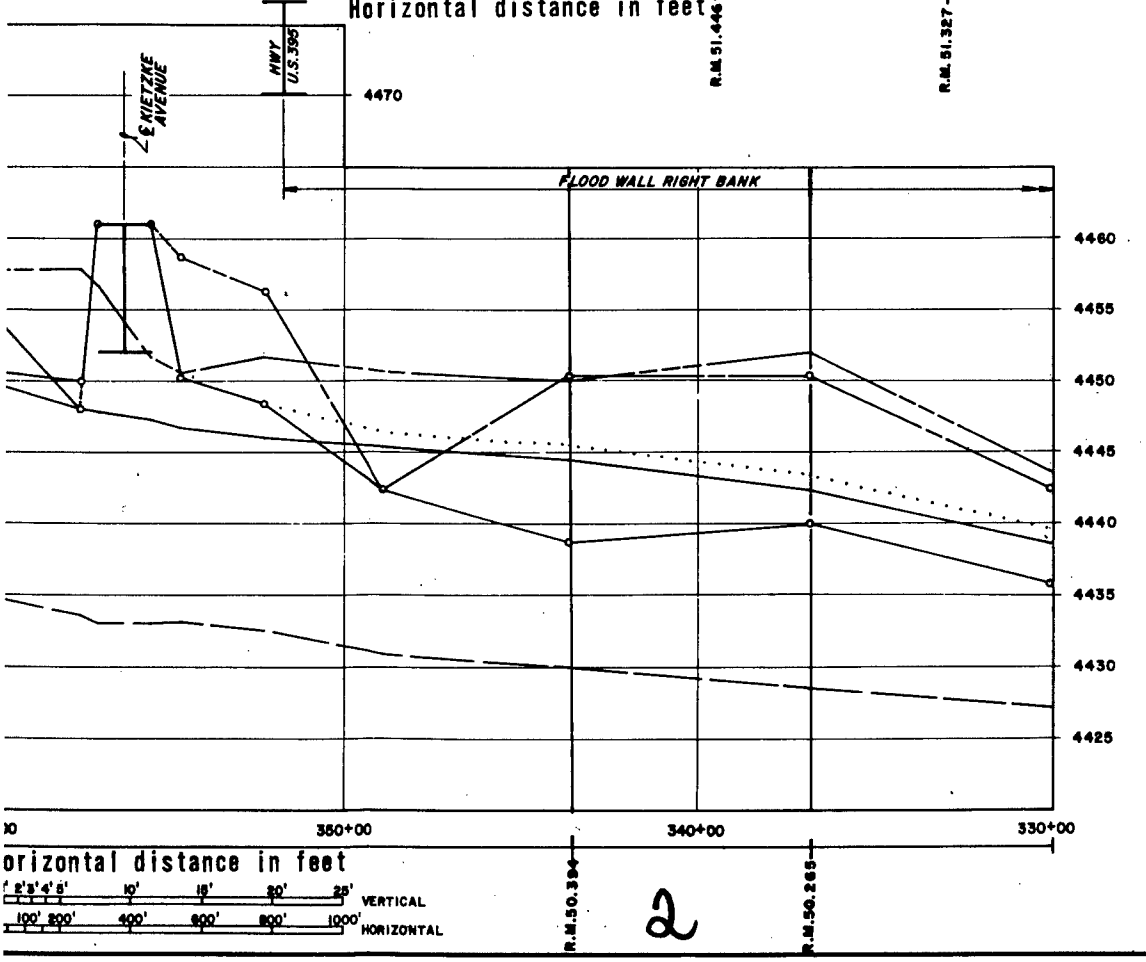
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 14


℄ SIERRA STREET BRIDGE REPLACED
℄ VIRGINIA STREET BRIDGE REPLACED
℄ CENTER STREET BRIDGE REPLACED
℄ LAKE STREET BRIDGE REPLACED
℄ EAST 2nd STREET
FLOOD WALL RIGHT BANK
CHANNEL EXCAVATION
FLOOD WALL LEFT BANK
R.M. 52.167
R.M. 52.093
R.M. 51.919
R.M. 50.813
℄ KIETZKE AVENUE
HWY U.S. 395
Elevation in feet above mean sea level
4500
4495
4490
4485
4480
4475
4470
4465
4460
4455
4450
4445
4440
4435
4430
4425
440+00
430+00
420+00
410+00
380+00
370+00
360+00
350+00
Horizontal distance in feet
SCALE: 1" = 8'-0"
SCALE: 1" = 200'-0"





LEGEND

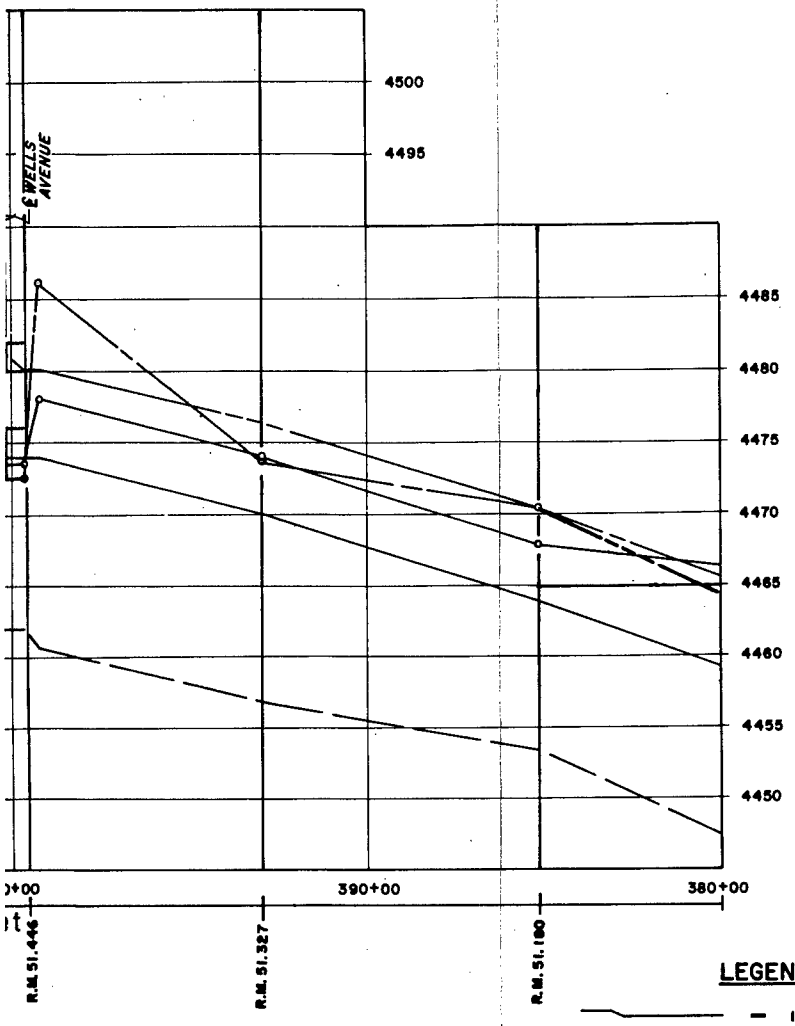
- 100 YEAR F
- STANDARD
- EXISTING LI
- EXISTING R
- CHANNEL
- IMPROVEMI
- IMPROVEME
- IMPROVEMI
- CROSS SE

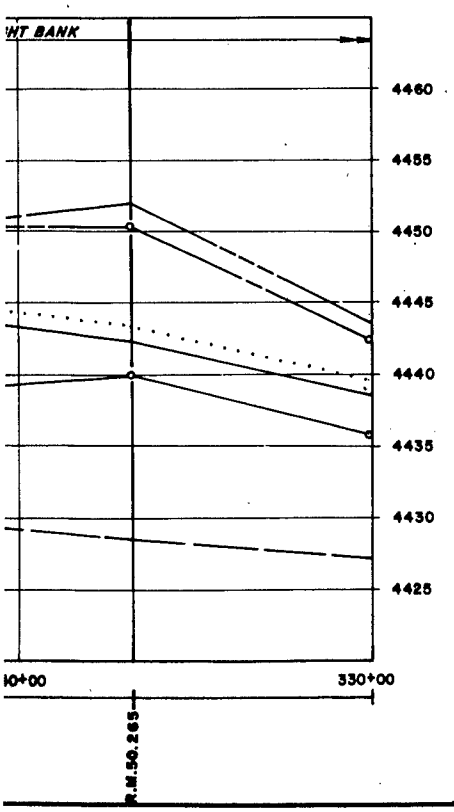
TRUCKEE ME
RENO-SPARKS MET

TRU
I
STA. 330+

SACRAMENTO DISTI
FE

VERTICAL: 2' 3' 4' 5' 10' 15' 20' 25'
HORIZONTAL: 100' 200' 400' 600' 800' 1000'





LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS/LEFT BANK
- IMPROVEMENTS/RIGHT BANK
- IMPROVEMENTS/LEFT & RIGHT BANKS
- CROSS SECTION

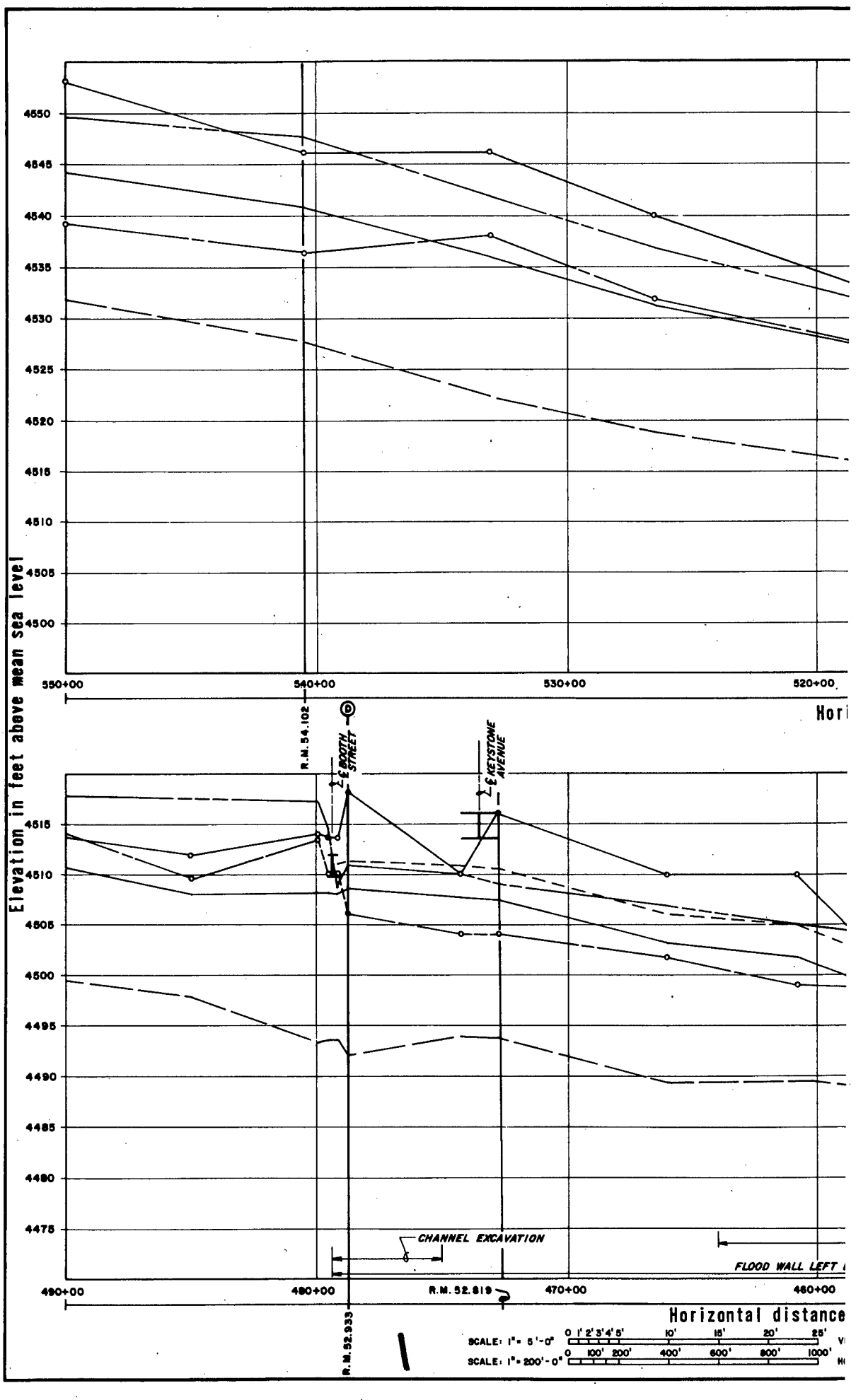
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

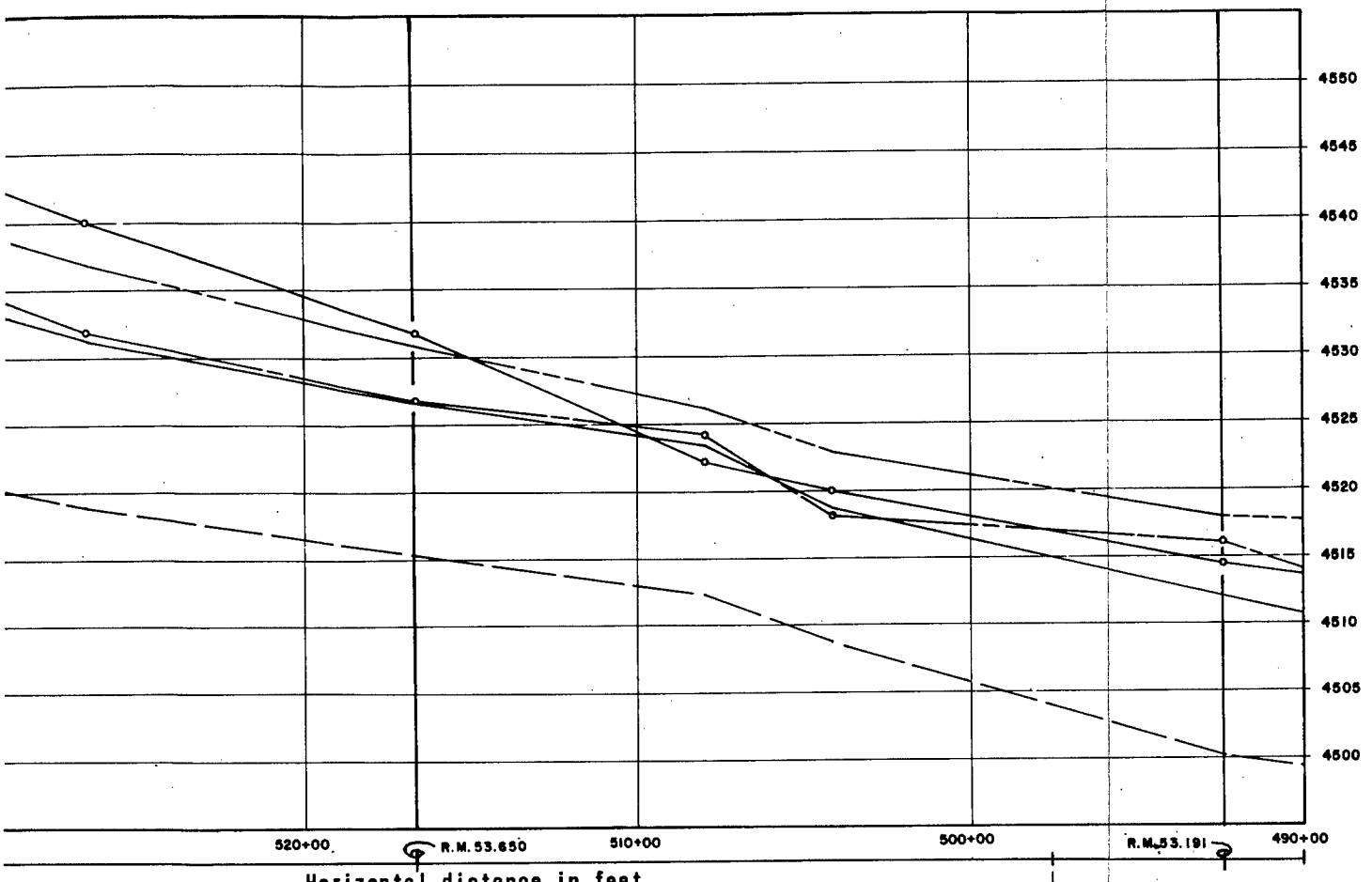
TRUCKEE RIVER
PROFILE
STA. 330+00 to STA. 440+00

3

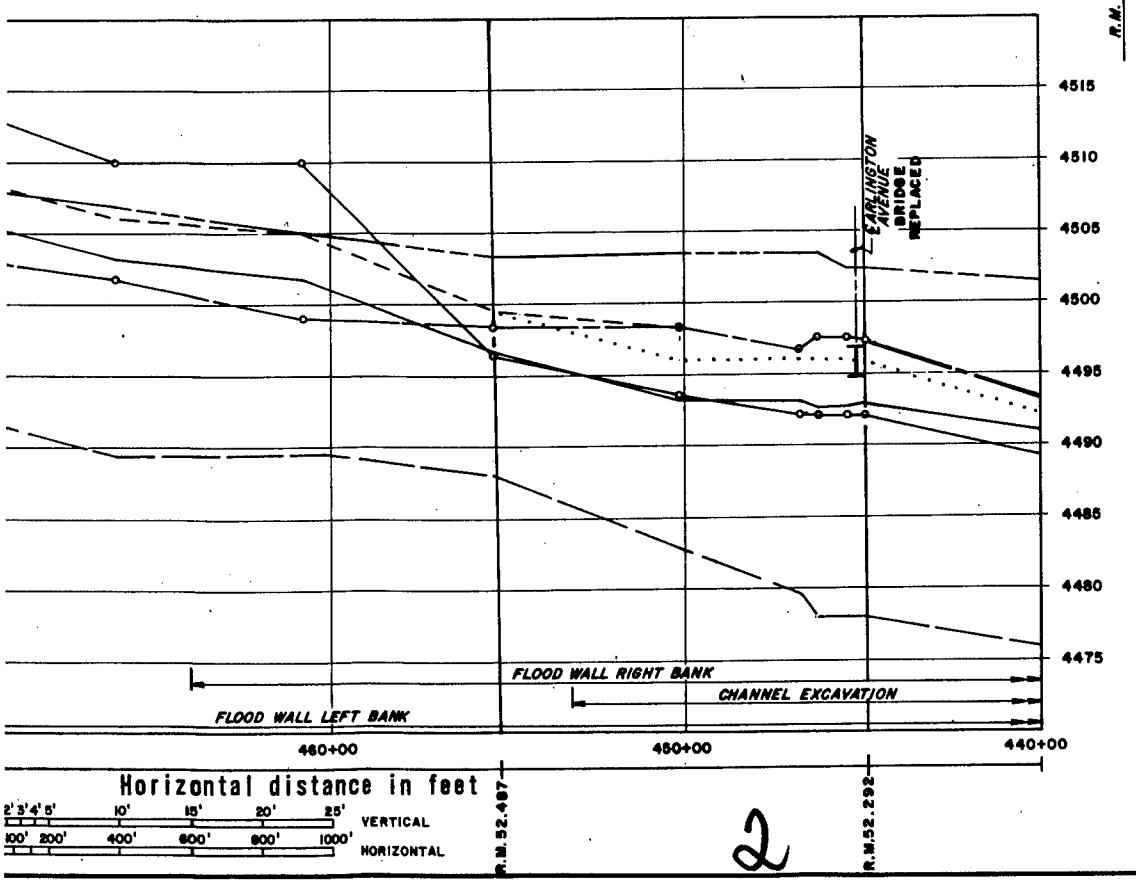
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 15


Elevation in feet above mean sea level
4550
4545
4540
4535
4530
4525
4520
4515
4510
4505
4500
4495
4490
4485
4480
4475
550+00
540+00
530+00
520+00
Hori
R.M. 54.102
℄ BOOTH STREET
℄ KEYSTONE AVENUE
CHANNEL EXCAVATION
FLOOD WALL LEFT
490+00
480+00
R.M. 52.819
470+00
460+00
R.M. 52.933
Horizontal distance
SCALE: 1"= 5'-0"
0 1' 2' 3' 4' 5' 10' 15' 20' 25'
SCALE: 1"= 200'-0"
0 100' 200' 400' 600' 800' 1000'



Horizontal distance in feet



Horizontal distance in feet

2' 3' 4' 5' 10' 15' 20' 25' VERTICAL

100' 200' 400' 600' 800' 1000' HORIZONTAL

R.M. 52.487

R.M. 52.292

LEGEND

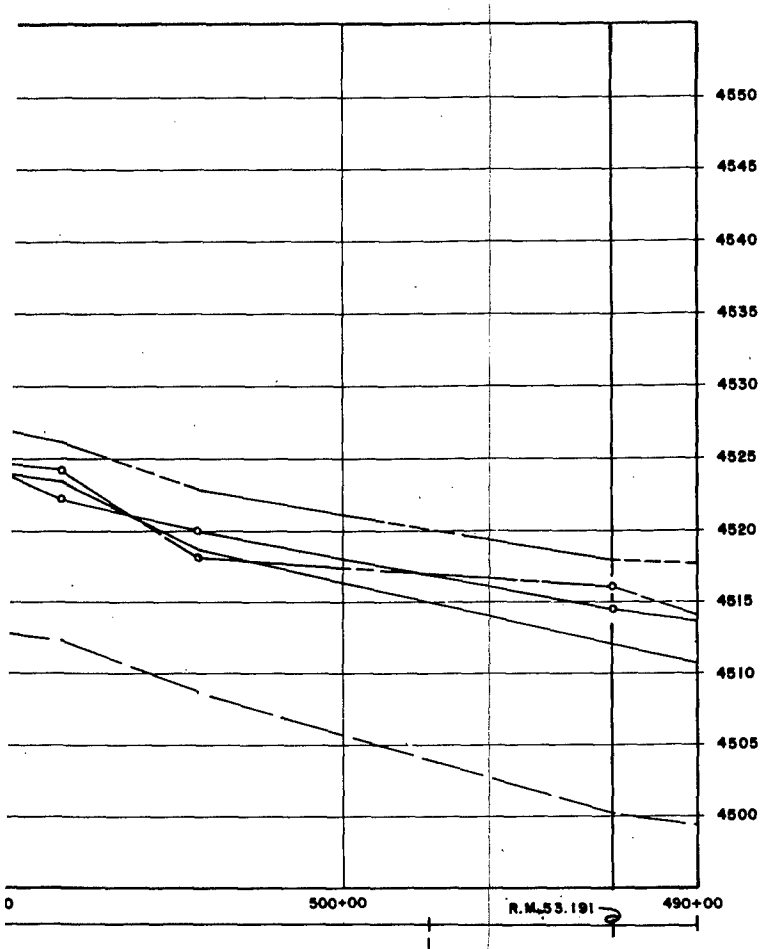
- 100 YEAR FLO
- STANDARD PR
- EXISTING LE
- EXISTING RI
- CHANNEL IN
- IMPROVEMENT
- IMPROVEMENT
- IMPROVEMEN
- D — CROSS SECT

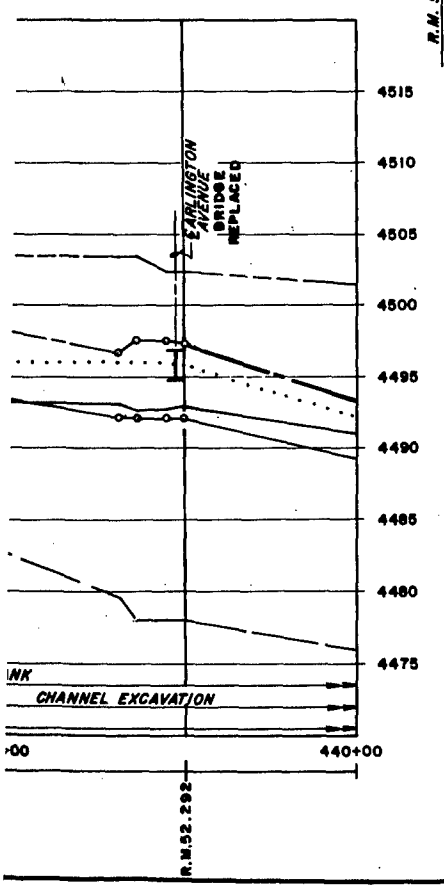
TRUCKEE MEAD
RENO-SPARKS METR

TRUC
P
STA.440+0C

SACRAMENTO DISTR
FEB

2





LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS - LEFT BANK
- IMPROVEMENTS - RIGHT BANK
- IMPROVEMENTS - LEFT & RIGHT BANKS
- CROSS SECTION

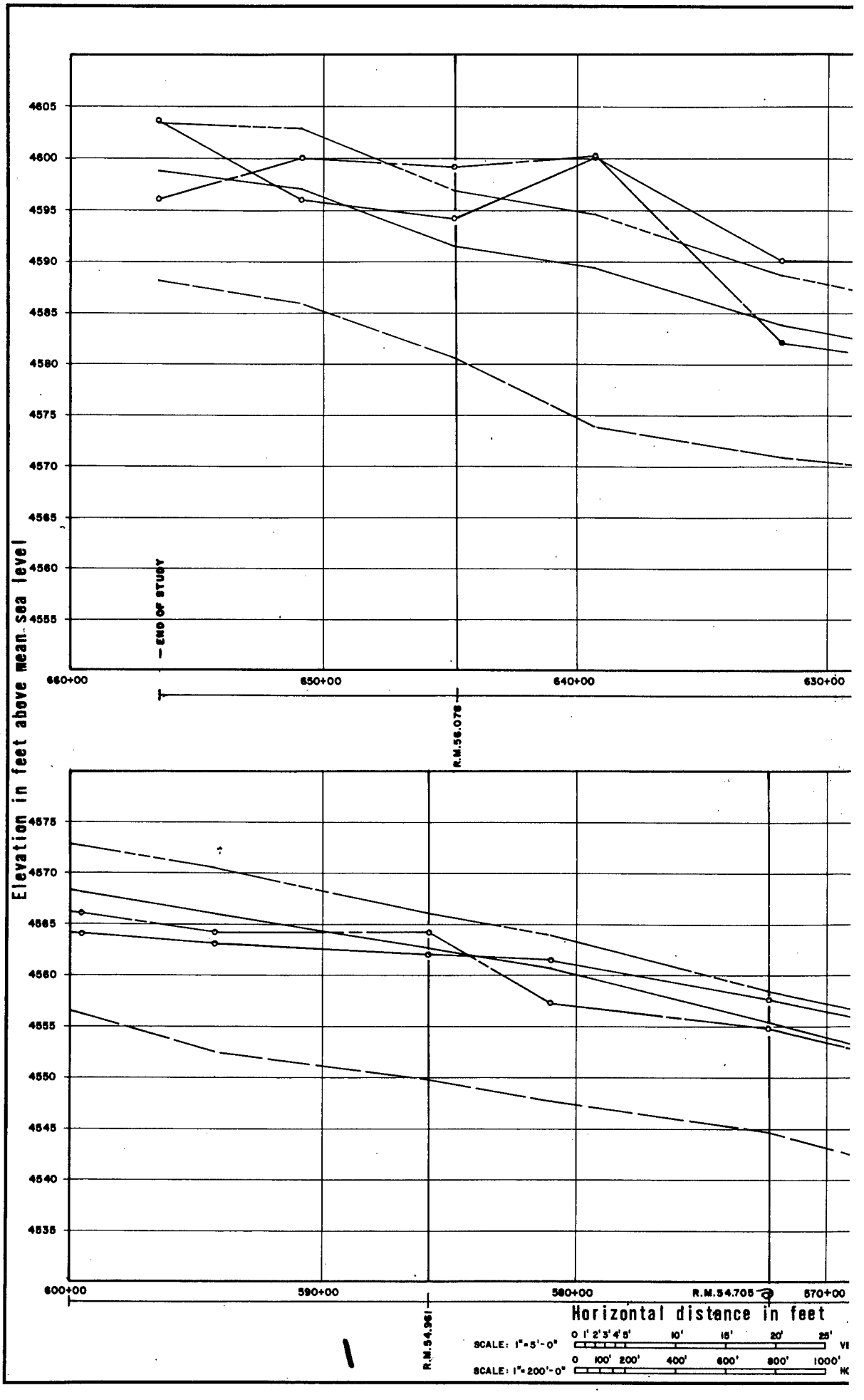
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

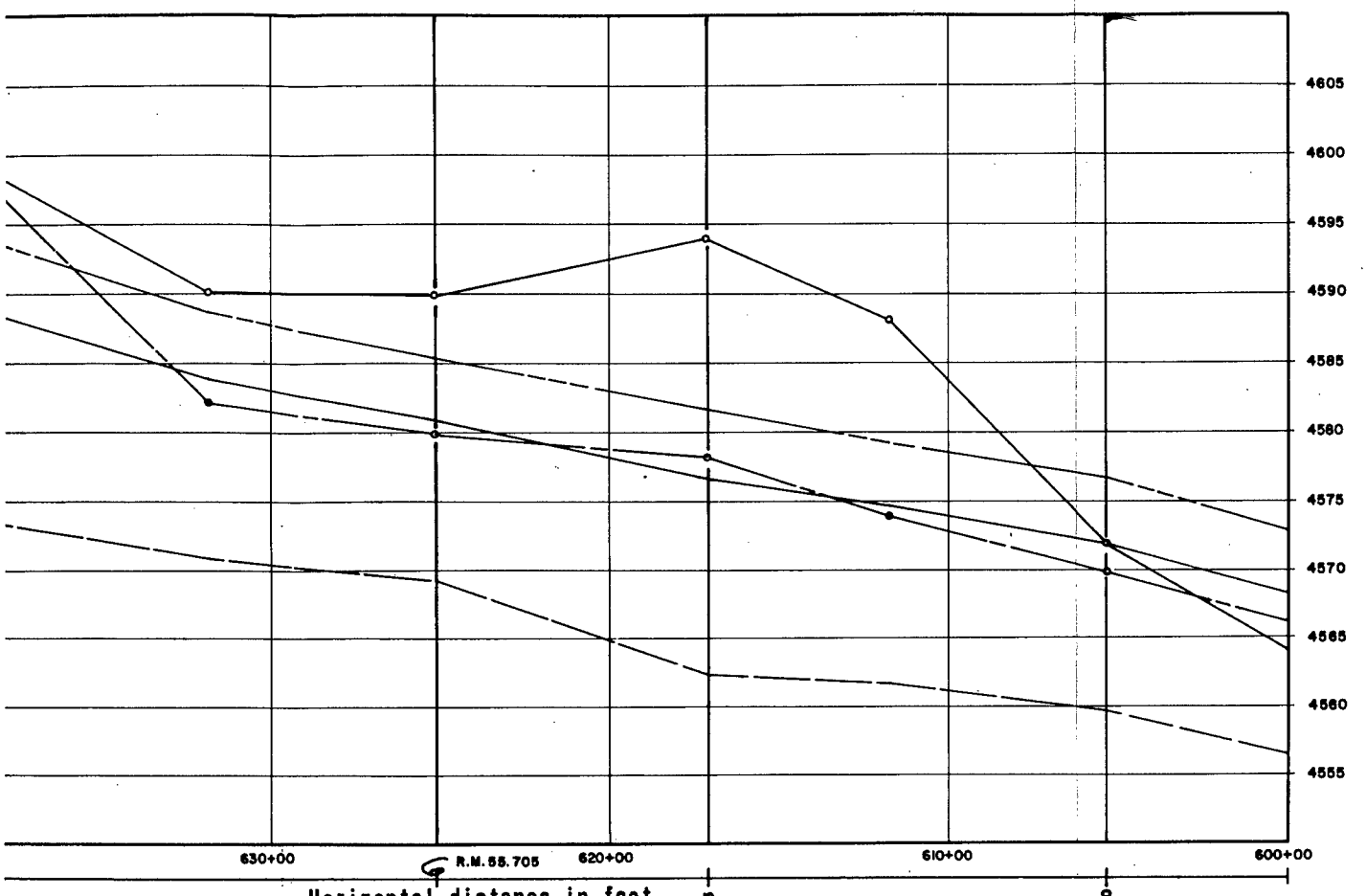
TRUCKEE RIVER
PROFILE
STA.440+00 to STA. 550+00

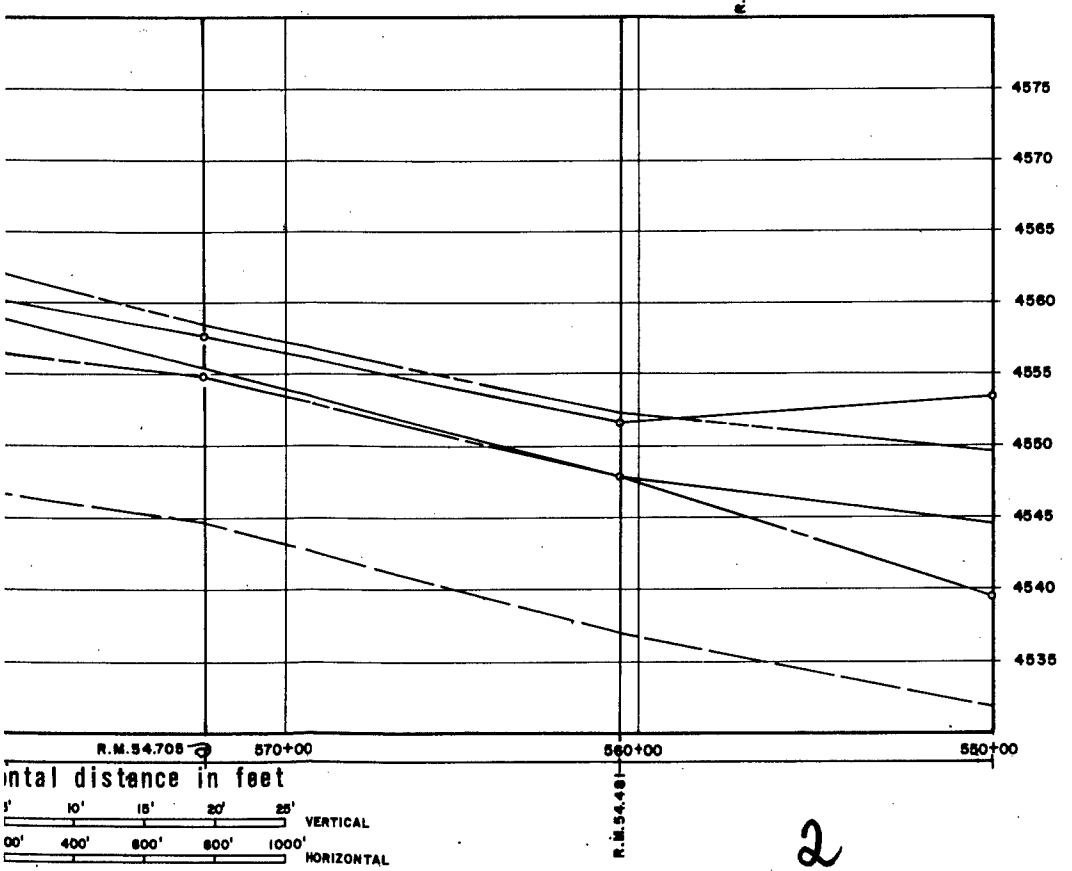
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 16


Elevation in feet above mean sea level
4605
4600
4595
4590
4585
4580
4575
4570
4565
4560
4555
END OF STUDY
660+00
650+00
640+00
630+00
R.M.56.078
4575
4570
4565
4560
4555
4550
4545
4540
4535
600+00
590+00
580+00
R.M.54.705
570+00
R.M.54.961
Horizontal distance in feet
SCALE: 1"=5'-0"
0 1' 2' 3' 4' 5' 10' 15' 20' 25'
SCALE: 1"=200'-0"
0 100' 200' 400' 600' 800' 1000'





LEGEND

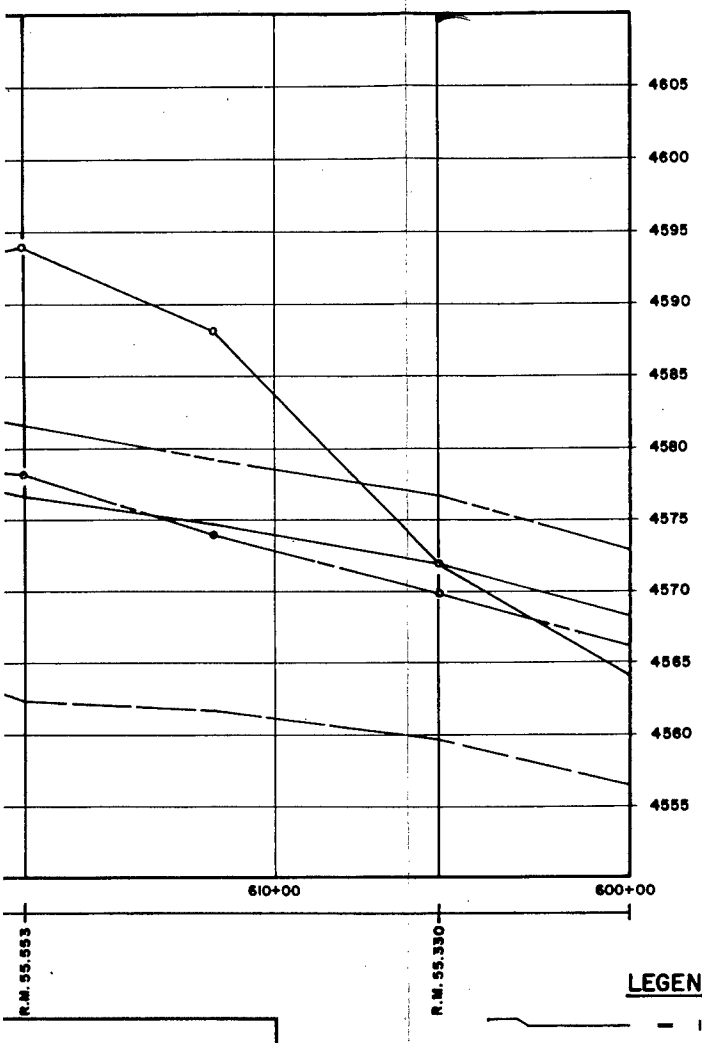
- 100 YEAR FLOOD
- STANDARD PROJECT
- EXISTING LEFT BA
- EXISTING RIGHT BA
- CHANNEL INVERT
- IMPROVEMENTS/LE
- IMPROVEMENTS/RI
- IMPROVEMENTS/LE

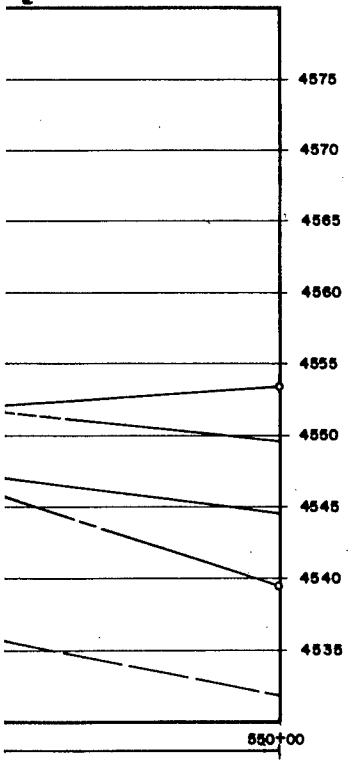
TRUCKEE MEADOW
RENO-SPARKS METROPO

TRUCKEE
PROF
STA. 550+00 to

SACRAMENTO DISTRICT,
FEBRUAR

2





LEGEND

- 100 YEAR FLOOD
- STANDARD PROJECT FLOOD
- EXISTING LEFT BANK
- EXISTING RIGHT BANK
- CHANNEL INVERT
- IMPROVEMENTS/LEFT BANK
- IMPROVEMENTS/RIGHT BANK
- IMPROVEMENTS/LEFT & RIGHT BANKS

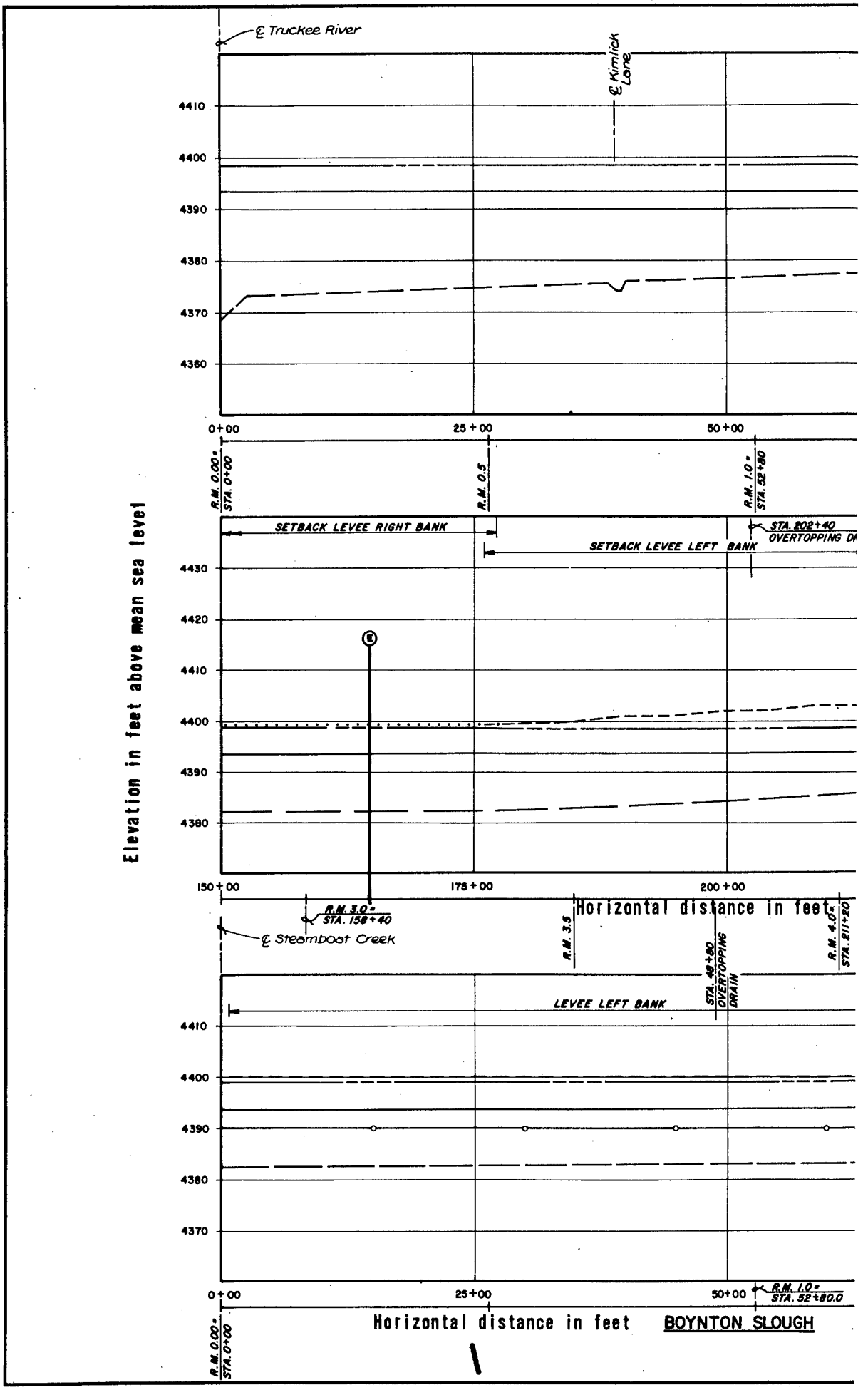
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

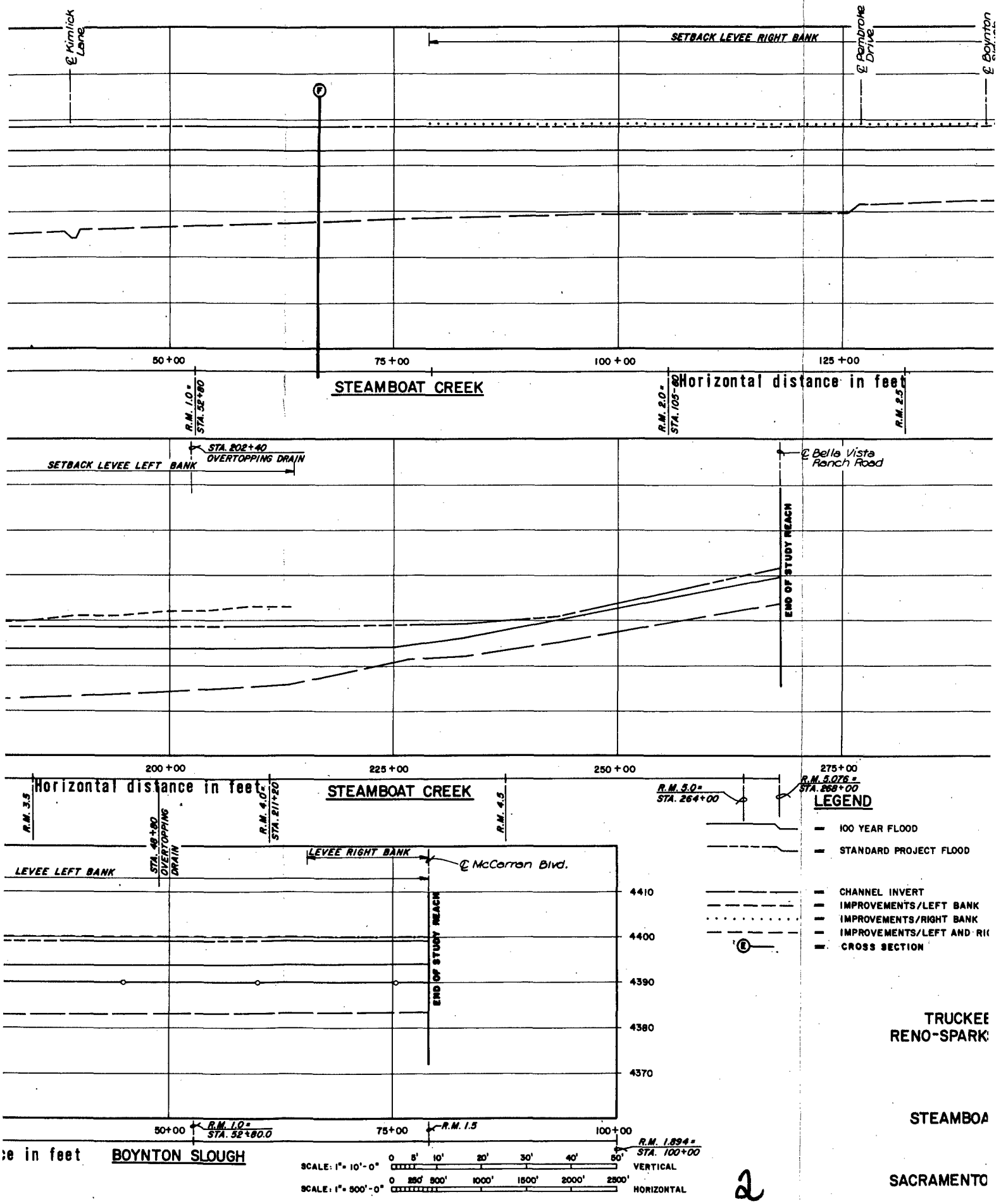
TRUCKEE RIVER
PROFILE
STA. 550+00 to STA. 660+00

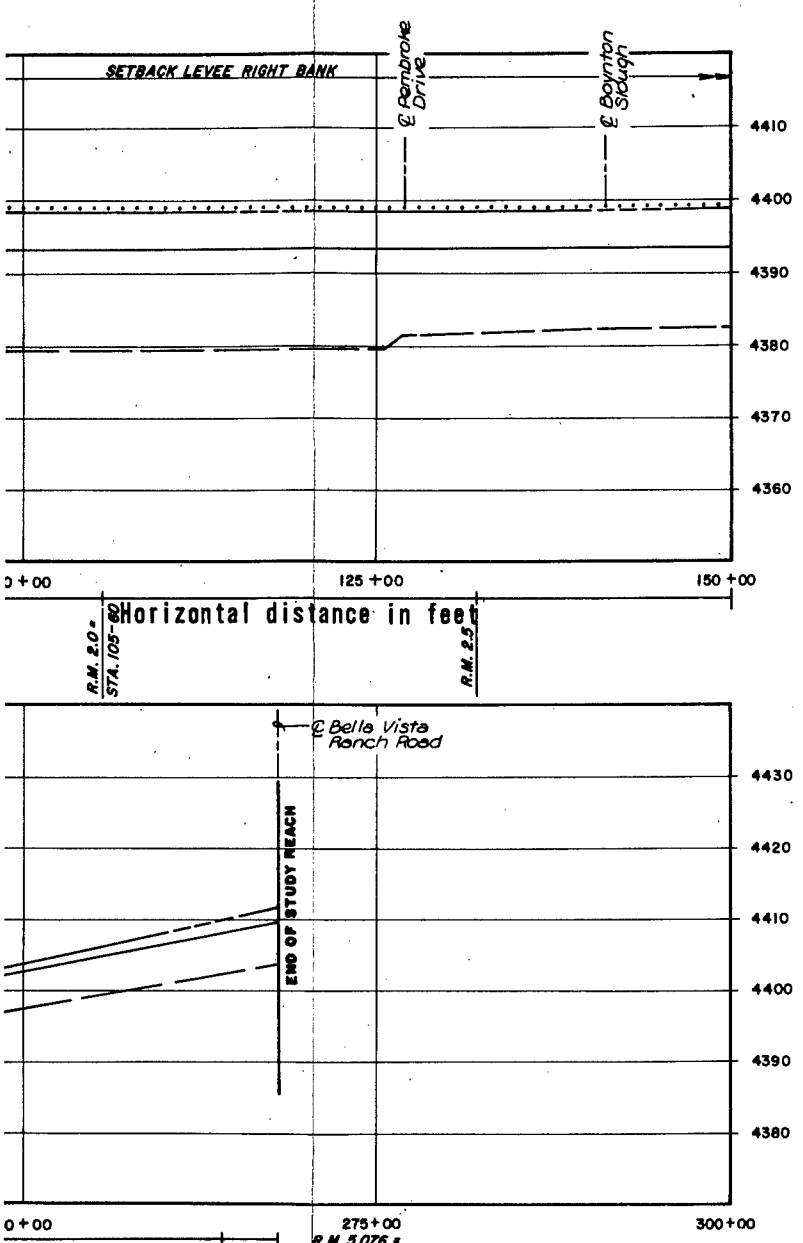
3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 17


℄ Truckee River
℄ Kimlick Lane
4410
4400
4390
4380
4370
4360
0+00
25+00
50+00
R.M. 0.00 = STA. 0+00
R.M. 0.5
R.M. 1.0 = STA. 52+80
SETBACK LEVEE RIGHT BANK
SETBACK LEVEE LEFT BANK
STA. 202+40 OVERTOPPING DR
4430
4420
4410
4400
4390
4380
150+00
175+00
200+00
R.M. 3.0 = STA. 158+40
℄ Steamboat Creek
R.M. 3.5
STA. 48+80 OVERTOPPING DRAIN
R.M. 4.0 = STA. 211+20
LEVEE LEFT BANK
4410
4400
4390
4380
4370
0+00
25+00
50+00
R.M. 1.0 = STA. 52+80.0
R.M. 0.00 = STA. 0+00
Elevation in feet above mean sea level
Horizontal distance in feet
Horizontal distance in feet
BOYNTON SLOUGH


℄ Kimlick Lane
SETBACK LEVEE RIGHT BANK
℄ Pembroke Drive
℄ Boynton
50+00
75+00
100+00
125+00
STEAMBOAT CREEK
Horizontal distance in feet
R.M. 1.0 = STA. 52+80
R.M. 2.0 = STA. 105+80
R.M. 2.5
STA. 202+40 OVERTOPPING DRAIN
SETBACK LEVEE LEFT BANK
℄ Bella Vista Ranch Road
END OF STUDY REACH
200+00
225+00
250+00
275+00
Horizontal distance in feet
STEAMBOAT CREEK
R.M. 3.5
R.M. 4.0 = STA. 211+20
R.M. 4.5
R.M. 5.0 = STA. 264+00
R.M. 5.076 = STA. 268+00
STA. 48+80 OVERTOPPING DRAIN
LEVEE LEFT BANK
LEVEE RIGHT BANK
℄ McCarran Blvd.
END OF STUDY REACH
4410
4400
4390
4380
4370
50+00
75+00
100+00
R.M. 1.0 = STA. 52+80.0
R.M. 1.5
R.M. 1.894 = STA. 100+00
BOYNTON SLOUGH
SCALE: 1"= 10'-0"
0 5' 10' 20' 30' 40' 50'
VERTICAL
SCALE: 1"= 500'-0"
0 250' 500' 1000' 1500' 2000' 2500'
HORIZONTAL
LEGEND
100 YEAR FLOOD
STANDARD PROJECT FLOOD
CHANNEL INVERT
IMPROVEMENTS/LEFT BANK
IMPROVEMENTS/RIGHT BANK
IMPROVEMENTS/LEFT AND RI
CROSS SECTION
TRUCKEE
RENO-SPARK
STEAMBOA
SACRAMENTO
2



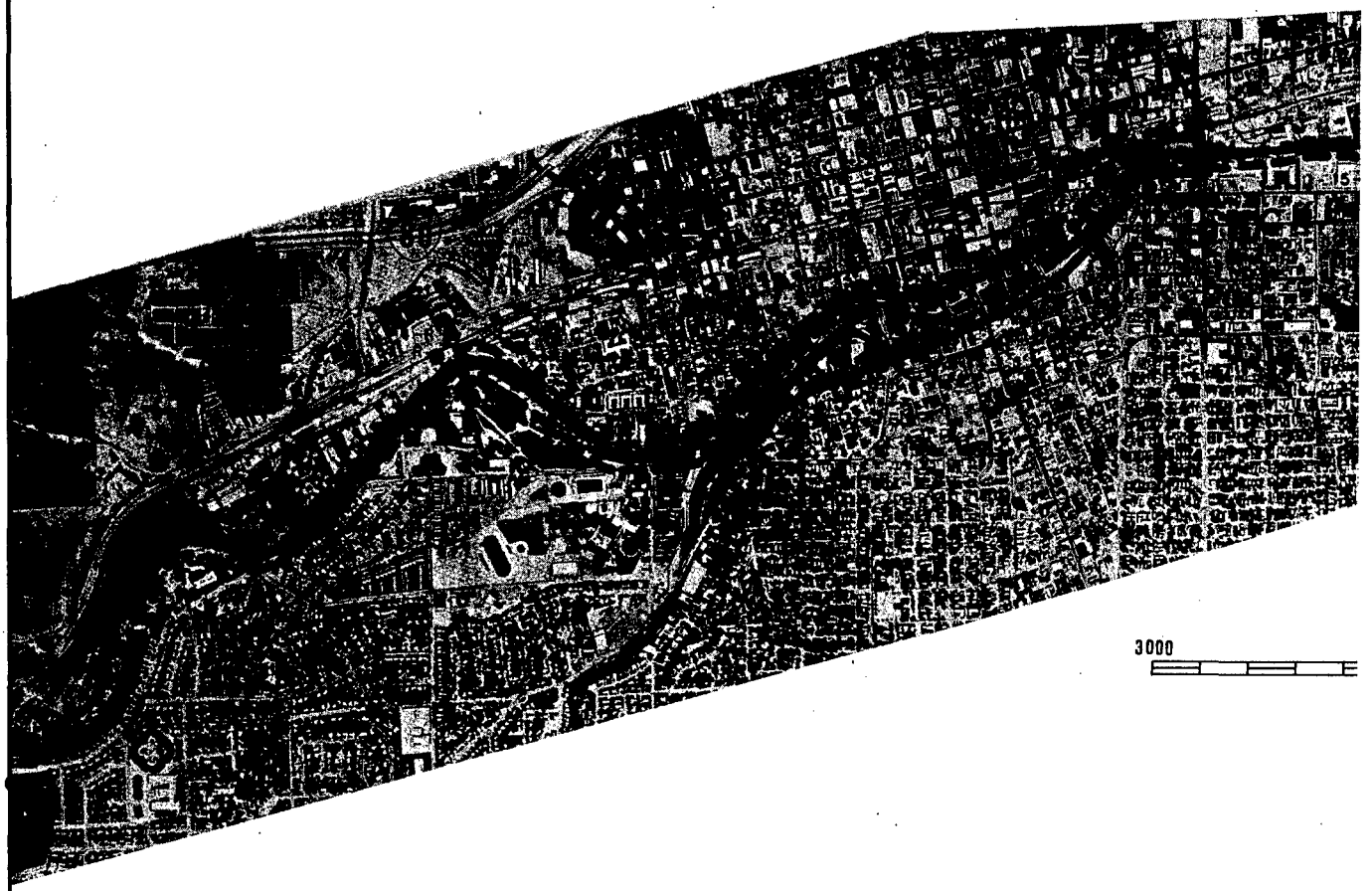
TRUCKEE MEADOWS INVESTIGATION
RENO-SPARKS METROPOLITAN AREA, NEVADA

PROFILE
STEAMBOAT CREEK / BOYNTON SLOUGH

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985

PLATE 18



EXISTING PUBLIC RECREATION FACILITIES

● I-R RIVER ACCESS / PARK (See Table 7)

PEDESTRIAN / BIKE PATH

PLANNED PUBLIC RECREATION ACCESS AND FACILITIES BY OTHERS

● PLANNED RECREATION ACCESS AREA

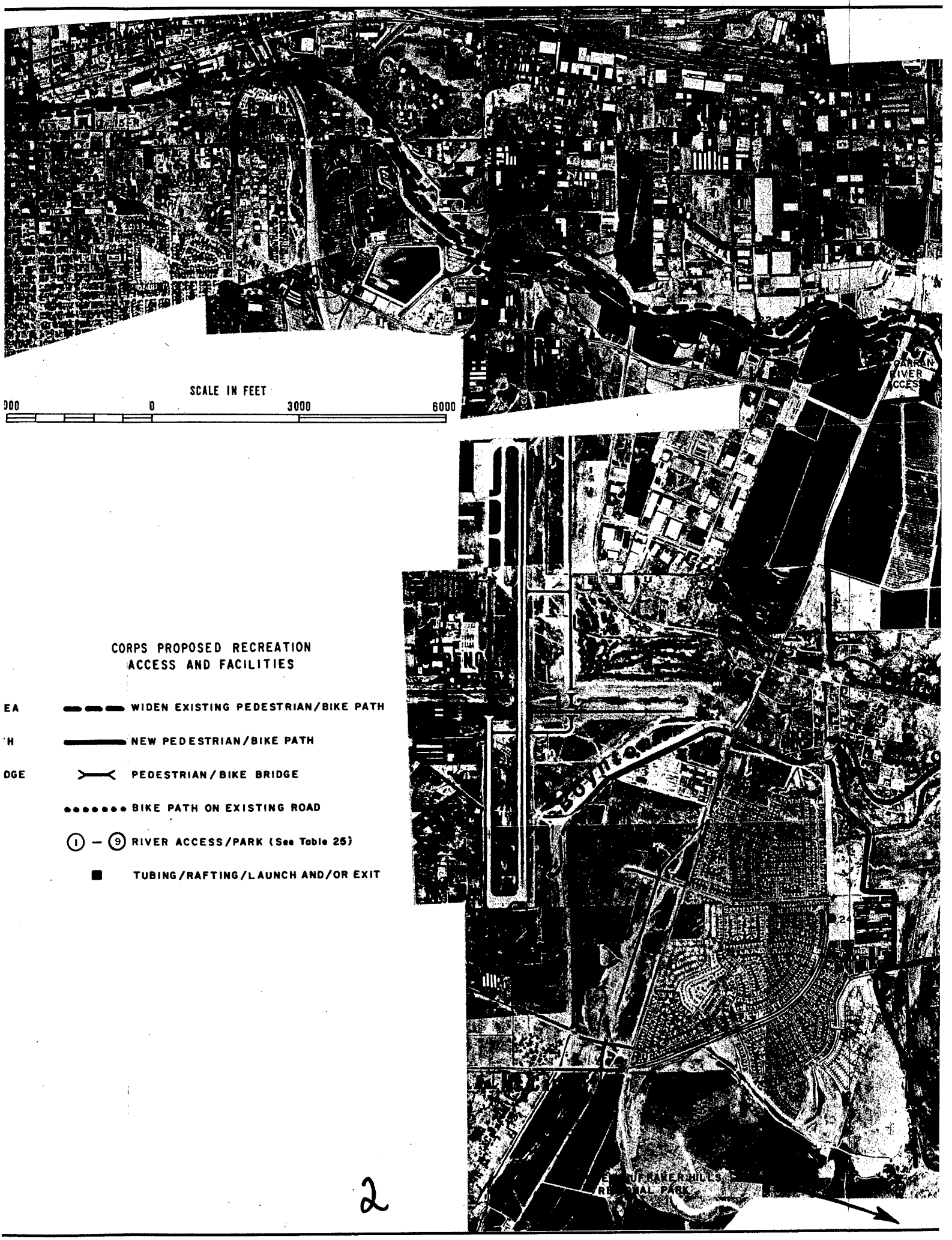
PLANNED PEDESTRIAN/BIKE PATH

PLANNED PEDESTRIAN/BIKE BRIDGE

COR

① – ⑨

■



CORPS PROPOSED RECREATION
ACCESS AND FACILITIES

EA — WIDEN EXISTING PEDESTRIAN/BIKE PATH

H — NEW PEDESTRIAN/BIKE PATH

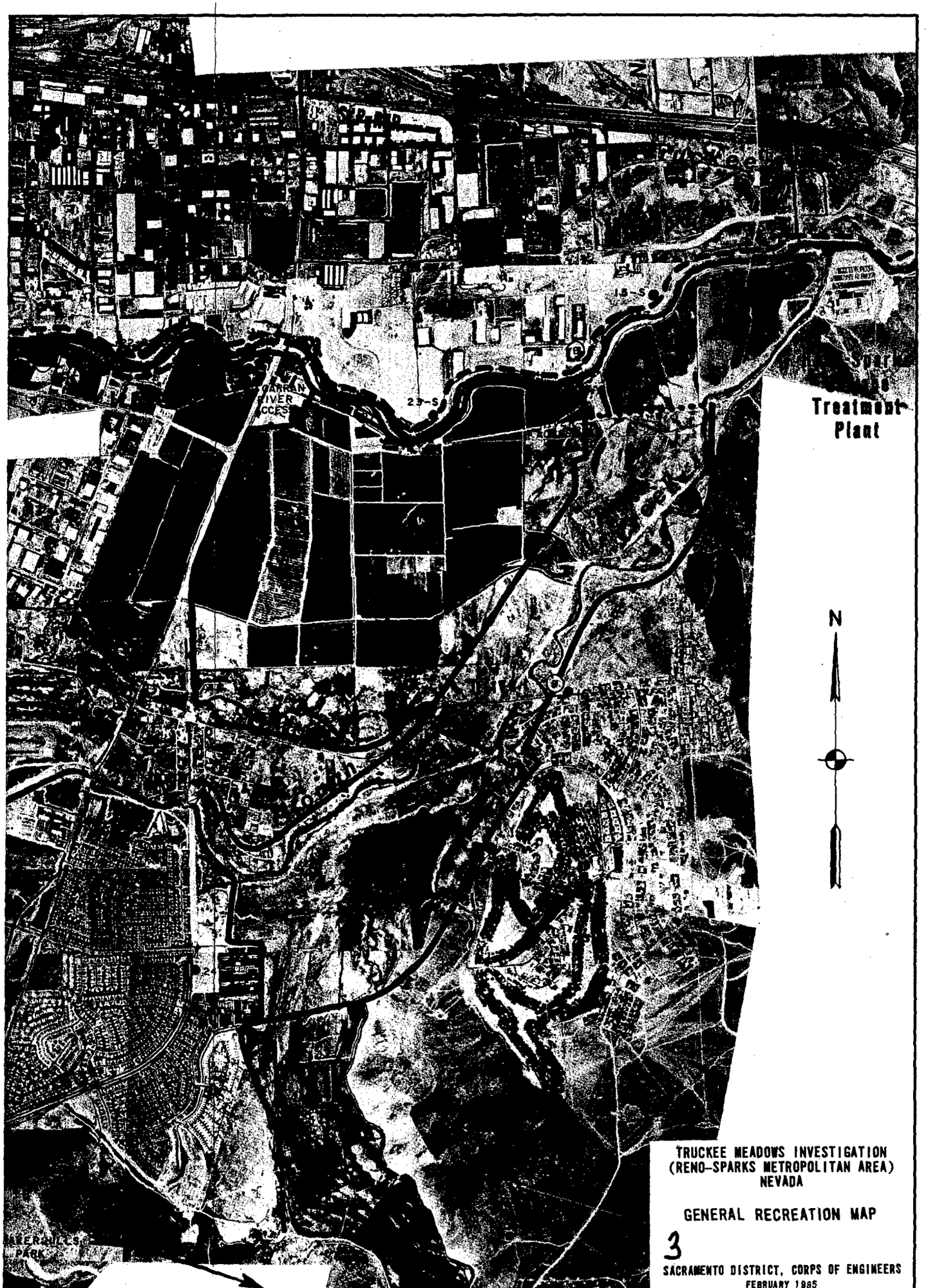
DGE — PEDESTRIAN/BIKE BRIDGE

BIKE PATH ON EXISTING ROAD

(1) – (9) RIVER ACCESS/PARK (See Table 25)

TUBING/RAFTING/LAUNCH AND/OR EXIT

2



TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA

GENERAL RECREATION MAP

3

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
FEBRUARY 1985
REVISED JULY 1985

Environmental Impact Statement

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA), NEVADA

February 1985

ADDENDUM
TO
FINAL ENVIRONMENTAL IMPACT STATEMENT

Environmental Consequences of the Modifications Recommended by the District Engineer, Sacramento District, to Feasibility Report for Truckee Meadows, (Reno-Sparks Metropolitan Area), Nevada.

July 1985

Abstract: The District Engineer recommended that since, at this time, no firm commitments for sponsorship have been received from either a Federal or non-Federal agency as anticipated, fish and wildlife enhancement features will not be included in the recommended plan. The plan recommended for Federal implementation includes all of the features of the selected plan, with the exception of the fish and wildlife enhancement features. Excluding the enhancement features from the recommended plan results in no adverse environmental impacts.

Responsible Office: U.S. Army Corps of Engineers
Sacramento District
650 Capitol Mall
Sacramento, California 95814-4794

Revised July 1985

Addendum
to
Final Environmental Impact Statement
(FEIS)

Environmental Consequences of Modifications Recommended by the District Engineer, Sacramento District, to Feasibility Report for Truckee Meadows, (Reno-Sparks Metropolitan Area), Nevada.

1. Rationale for recommended changes to proposed plan. - The fish and wildlife enhancement features developed to complement flood control features were included in the proposed plan based upon recommendations received from the U.S. Fish and Wildlife Service, contained in their detailed report as required by the Fish and Wildlife Coordination Act. The enhancement features include (1) acquisition and development of Steamboat Marsh Wetland for waterfowl and other values, (2) riparian plantings along Steamboat Creek, and (3) boulder placement for fish habitat improvements in the Truckee River. In accordance with the Fish and Wildlife Coordination Act report, these features support two Federal programs, the Endangered Species Act and the Migratory Bird Conservation Act.

2. During the review period, the U.S. Fish and Wildlife Service was asked to confirm their assurances that they will administer the fish and wildlife enhancement features of the proposed project. In a letter dated 13 June 1985 the Portland Regional Office of the U.S. Fish and Wildlife Service stated they would be unable to make a commitment at this time to administer these enhancement features in support of Federal authorized programs. An attempt was made to acquire non-Federal participation in such enhancement features. The Nevada Department of Wildlife and other non-Federal agencies have been unable to provide assurances that they could participate with the Federal government in the fish and wildlife enhancement features of the project.

3. In view of the inability of U.S. Fish and Wildlife Service to provide assurances to administer the enhancement features and the absence of a non-Federal sponsor, the District Engineer recommended that the enhancement features recommended by the U.S. Fish and Wildlife Service not be included in the recommended plan due to an inability to acquire Federal or non-Federal sponsorship.

4. Recommended changes to the proposed plan and the 404(b)1 Evaluation. - The recommended plan would be essentially the same as the original recommended plan, except that fish and wildlife enhancement features would not be included in the plan. The 404(b)1 evaluation will be pertinent only to effects of flood control, recreation and fish and wildlife mitigation features of the project.

5. Environmental consequences of recommended changes. - No adverse impacts to existing conditions are expected to be produced from the recommended changes, since these features reflect efforts to improve the environmental quality of the project area.

6. Principal Preparer: The following person was primarily responsible for preparing the Addendum to the FEIS.

Name	Discipline/Expertise	Experience in Relevant Fields
Matthew G. Davis	Environmental Planning/ Wildlife Biology	2 years

Revised July 1985

ENVIRONMENTAL IMPACT STATEMENT

Proposed Plan for Flood Control, Recreation, and Fish and Wildlife Enhancement in the Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada

The responsible lead agency is the U.S. Army Engineer District, Sacramento.

Abstract: Truckee Meadows is located in Washoe County in Western Nevada. The study area includes the Truckee River from the western end of the Reno city limits to Vista, that portion of Steamboat Creek north of Huffaker Hills, and Boynton Slough east of Boynton Lane. The primary purpose of this investigation is to determine the feasibility of providing additional flood protection to the highly developed commercial and residential areas in Reno and Sparks. Riparian vegetation, marshes and other habitat along the Truckee River and in Truckee Meadows support diverse fish and wildlife resources and are an important recreational resource. Recreation and fish and wildlife mitigation and enhancement plans have been developed and are included in this analysis. The two candidate plans under consideration are the no action plan and levee plan with detention basin (selected plan). The selected plan would provide 100-year flood protection to lands within the Truckee River flood plain and a lesser degree of protection to the study area. Recreation development is proposed as part of the selected plan. Fish and wildlife mitigation and enhancement would be provided. Significant resources impacted by the plans are the following: hydrology, water quality, riparian and wetland vegetation, fish and wildlife, threatened and endangered species, agriculture, recreation, esthetics, and cultural resources.

SEND YOUR COMMENTS TO THE BOARD OF ENGINEERS OF RIVERS AND HARBORS BY (date: 30 days from transmittal date)
If you would like further information on this EIS, please contact: Mr. Allan Oto at the above address or telephone (916) 440-2360 or FTS 448-2360.

Note: Information displays, maps, etc. discussed in the Truckee Meadows (Reno-Sparks Metropolitan Area) Feasibility Report are incorporated by reference into this EIS.

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ATTACHMENTS

1. Letters and Statements Commenting on the Draft EIS and Responses

2. Section 404(b)(1) Evaluation

3. U.S. Fish and Wildlife Service Coordination Act Report

4. Endangered Species Section 7 Biological Assessment and Biological Opinion

5. U.S. Fish and Wildlife Service Planning Aid Letter of Environmental Impacts relative to North Truckee Drain/Peoples Drain Project Features.

1.0 Summary

1.1 Major Conclusions and Findings Since the study authorization in 1964, numerous structural and nonstructural plans for flood control in the Reno-Sparks Truckee Meadows area have been analyzed. Most of these alternatives have been rejected due to inability to solve flood problems, lack of economic feasibility, environmental constraints, and/or opposition by local interests. Studies during this feasibility stage resulted in the levee plan with detention basin, which meets the Federal objective of maximizing the net economic benefits while protecting the Nation's environment. The Federal no action alternative would result in no action by the Federal Government to control flooding in the study area.

Adverse impacts result primarily from channel alteration and excavation, bridge replacement, and removal of riparian vegetation. The significant resources which potentially could be adversely impacted are hydrology, water quality, riparian and wetland vegetation, fish, wildlife, threatened and endangered species, recreation, esthetics, and cultural resources.

The levee plan with detention basin is the selected plan, as it would provide necessary flood control, satisfy major environmental concerns, and provide the highest net economic benefits. The selected plan generally has reduced adverse impacts by minimizing channel excavation and aligning levees to avoid mature riparian vegetation and existing recreation areas wherever possible. Use of the detention basin satisfies a major concern that floodflows downstream from Vista do not exceed preproject levels. Many of the impacts associated with construction of the selected plan are expected to be of a short-term nature or can be fully mitigated. These include degradation of water quality, removal of 23.2 acres of riparian and 2.6 acres of wetland vegetation, disturbance of native fish populations and degradation of spawning habitat, some dislocation of wildlife, and reduced recreation quality. Removal of the Virginia Street Bridge, which is on the National Register of Historic Places, would be a permanent loss. Over the long-term, riparian vegetation on the Truckee River will be increased due to proposed plantings, and this will benefit fish and wildlife. The proposed acquisition and preservation of 300 acres in the Steamboat Marsh area will significantly enhance wildlife values. Completion of the planned recreation areas and improvements would increase recreation use of the river and the Truckee Meadows.

1.2 Areas of Controversy During coordination of preliminary flood control plans, several areas of controversy emerged concerning the impacts of the alternatives on the endangered and threatened fish, riparian vegetation, and existing recreation facilities. There was also concern that further regulations would be imposed on development within the flood plain in Sparks, which the city proposed to fully develop for industrial uses. A more recent concern by the Nevada State Historic Preservation Officer has been the loss of historical values associated with removal and replacement of the Virginia Street Bridge and other bridges. The University of Nevada has expressed concern over possible disruption of experiments at its Experimental Field Laboratory. With the exception of proposed impacts on the bridges, coordination with agencies expressing these concerns and changes in design which have been incorporated into the selected plan have largely resolved these controversies. A further discussion is found in Section 6.4.

1.3 Unresolved Issues Although coordination to mitigate for the loss of Virginia Street Bridge is being carried out with responsible agencies, it may not be possible to provide sufficient mitigation to overcome all objections to the removal of the bridge.

1.4 Relationship to Environmental Requirements The relationship of the selected plan to Federal, State, and local environmental laws, executive orders, and other policies are discussed in the text below and displayed in Table 1, which follows paragraph 1.4 (28).

(1) Archeological and Historic Preservation Act The selected plan is in full compliance at this time. The selected plan would replace the Virginia Street Bridge and the other five bridges. There may be other cultural sites not yet identified and evaluated for the National Register of Historic Places. If a project is authorized an intensive survey and evaluation will be conducted. Coordination with the State Historic Preservation Officer and the Advisory Council on Historic Preservation will be completed to determine mitigation/preservation measures under a Memorandum of Agreement. Mitigation and/or preservation would be undertaken during project construction.

(2) Clean Air Act The selected plan is in full compliance. Federal, State, and local air requirements will be included in detailed design studies after project authorization and coordinated with the concerned agencies to insure compliance with the State Implementation Plan.

(3) Clean Water Act The selected plan is in compliance. An evaluation in accordance with Section 404(b)(1) of the Clean Water Act is attached. Processing of this EIS to Congress in accordance with Section 404(r) of the Act will complete the process.

(4) Coastal Zone Management Act. This Act is not applicable to the study area.

(5) Endangered Species Act The selected plan is in full compliance. A biological data report and a biological assessment based on the selected plan has been completed and coordinated with the U.S. Fish and Wildlife Service (FWS), the Nevada Department of Wildlife (NDW), and Pyramid Lake Paiute Tribe. It is the biological opinion of the FWS that actions proposed in the Truckee Meadows Feasibility Report and Environmental Impact Statement are not likely to jeopardize the continued existence of the listed endangered cui-ui or threatened Lahontan cutthroat trout. These are the only listed species occurring in the study area. Formal consultation on impacts has been completed, the biological assessment follows the EIS.

(6) Estuary Protection Act. This Act is not applicable to the study area.

(7) Farmland Protection Act of 1982 The selected plan is in full compliance. The act generally requires that if prime farmland is affected, consulation must be carried out with the United States Soil Conservation Service (SCS) to determine applicability of the Act and any adverse impacts. Coordination has been maintained with the Nevada State Conservationist in order to determine impacts on prime farmland. A rating form has been completed and is being coordinated with the SCS to aid in predicting impacts to farmlands.

(8) Federal Water Project Recreation Act The selected plan is in full compliance. A preliminary recreation plan has been developed, and coordinated with State and local agencies. Letters of intent for non-Federal support of recreation facilities have been provided.

(9) Fish and Wildlife Coordination Act The selected plan is in full compliance. The FWS Final Coordination Act Report has been prepared. Mitigation and enhancement recommendations are included in this EIS and the Coordination Act Report follows the EIS in the attachment section.

(10) Land and Water Conservation Fund Act (LWCFA) The selected plan is in full compliance. The EIS has been coordinated with the National Park Service (NPS) which administers the Act because some of the existing recreation facilities, which will be disturbed by construction, were built with funds from this Act. During coordination of the recreation plan with NPS, they requested by letter, dated September 28, 1983, identification of LWCFA funded lands and facilities which will be impacted. Contact was made with Nevada Division of State Parks (LWCFA Nevada representative) and the parks departments of Washoe County and the Cities of Reno and Sparks for LWCFA information. The impacts have been described in paragraph 5.2 in this EIS. Coordination with NPS will continue into detailed design which is after project authorization.

(11) Marine Protection Research and Sanctuaries Act This Act does not apply to the study area.

(12) National Historic Preservation Act Coordination with the Advisory Council on Historic Preservation concerning the Virginia Street Bridge, a National Register of Historic Places property, has been initiated. When the project is authorized, an intensive survey and evaluation of cultural resources will be completed. The Advisory Council on Historic Preservation will be requested to comment on impacts and proposed mitigation/preservation measures for National Register eligible sites.

(13) National Environmental Policy Act (NEPA) The alternatives are in compliance. This EIS has been prepared in accordance with NEPA regulations issued by the Council of Environmental Quality. Filing of the EIS and Record of Decision with the Environmental Protection Agency will complete the process.

(14) Rivers and Harbors Act The selected plan is in full compliance and would not obstruct navigable waters.

(15) Watershed Protection and Flood Prevention Act The selected plan is in compliance. The SCS has no proposed flood control facilities within the study area or the watershed. SCS hydrologic data on completed facilities was used in developing the selected plan.

(16) Wild and Scenic River Act The selected plan will not conflict with any designated river. No reach of the Truckee River or Steamboat Creek is being considered for wild and scenic river designation.

(17) Flood Plain Management (EO 11988) The selected plan is in full compliance. Lands within the detention basin and along Steamboat Creek would be designated as a permanent floodway. Other flood plain management measures will be the responsibility of the Federal Emergency Management Agency (FEMA) and the Cities of Reno and Sparks and Washoe County.

(18) Protection of Wetlands (EO 11990) The selected plan is in full compliance. Impacts to riparian vegetation and marsh vegetation would be minimized and then fully mitigated. Proposed enhancement measures would significantly increase the acreage of wetland vegetation.

(19) Pollution Control Standards (EO 12088) The selected plan is in full compliance. Further coordination with the Environmental Protection Agency, State, and local agencies concerning prevention and control of environmental pollution will occur during detailed project design. Other acts, such as the Clean Air and Clean Water Acts, covered by this executive order are listed separately.

(20) Recreation in Nevada, Statewide Comprehensive Outdoor Recreation Plan (SCORP) The selected plan would provide recreation needs as described in the plan and is in full compliance.

(21) Washoe County Open Space Plan The selected plan is in full compliance with plans for the Truckee River Greenbelt.

(22) Washoe County Water Quality Management Plan The selected plan is in full compliance with the goal of promoting propagation of fish and wildlife and enhancement of water quality.

(23) Washoe County Conservation Element The selected plan would be in full compliance with goals for flood protection and wetland protection.

(24) Reno Policy Plan The selected plan is in full compliance with flood plain management goals. The selected plan is compatible with the community design goals for downtown Reno. The removal of the historic bridges would conflict with the design goals for historic preservation.

(25) Downtown Reno Redevelopment Plan The selected plan is in full compliance with the concepts of this plan developed by consultants and adopted by the City of Reno. A basic difference between the two plans is the floodwall design; the selected plan has vertical walls and the Redevelopment Plan has stepped floodwalls. Coordination among the Corps, City of Reno, and the city's consultant has resulted in the city's plan being compatible for flood control with the selected plan. Also, if the selected plan is authorized for construction before downtown redevelopment occurs, the stepped floodwalls can be incorporated into the design.

(26) Truckee River Corridor Development Plan The selected plan is in compliance with this plan.

(27) Southeast Truckee Meadows Policy Plan The selected plan is in full compliance with flood control objectives and preservation of wetlands.

(28) City of Sparks Master Plan for Growth Management The selected plan is in non-compliance with this plan because the Management Plan expressly rejects the need for the Corps to construct any major flood control improvements on the Truckee River which "divert, straighten, channelize or otherwise tamper with the natural course and character of the river in any major way." However, in a written response to the Draft EIS, the City of Sparks modified this policy by noting "the need for flood control measures" in regard to the Truckee River.

TABLE 1

COMPLIANCE OF ALTERNATIVES WITH ENVIRONMENTAL REQUIREMENTS[1/]

	No Action Alternative	Levee Plan with Detention Basin (Selected Plan)
FEDERAL STATUTES		
Archeological and Historic Preservation Act as amended, 16 U.S.C. 469 et seq.	N/A	Full[2/]
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	N/A	Full
Clean Water Act, as amended, 33 U.S.C. 1344, et seq.	N/A	Full
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	N/A	N/A
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq.	N/A	Full
Estuary Protection Act, 16 U.S.C. 1221, et seq.	N/A	N/A
Farmland Protection Act of 1982	N/A	Full
Federal Water Project Recreation Act 16 U.S.C. 460-(12), et seq.	N/A	Full
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	N/A	Full
Land and Water Conservation Act, as amended, 16 U.S.C. 4601-11, et seq.	N/A	Full
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, et seq.	N/A	N/A
National Historic Preservation Act, as amended, 16 U.S.C., 470 a, et seq.	N/A	Full[2/]
National Environmental Policy Act (NEPA) as amended, 42 U.S.C. 4321, et seq.	Full	Full
Rivers and Harbors Act 33 U.S.C., et seq.	N/A	Full
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	N/A	Full
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A	Full

TABLE 1 (Cont'd)

COMPLIANCE OF ALTERNATIVES WITH ENVIRONMENTAL REQUIREMENTS

EXECUTIVE ORDERS, MEMORANDA	No Action Alternative	Levee Plan with Detention Basin (Selected Plan)
Flood Plain Management (E.O. 11988)	N/A	Full
Protection of Wetlands (E.O. 11990)	N/A	Full
Pollution Control Standards (E.O. 12088)	N/A	Full
STATE AND LOCAL POLICIES		
Recreation in Nevada, Statewide Comprehensive Outdoor Recreation Plan, 1982	N/A	Full
Washoe County Open Space Plan, 1977	N/A	Full
Washoe County Water Quality Management Plan, 1978	N/A	Full
Washoe County Conservation Element, 1982	N/A	Full
Reno Policy Plan, 1982	N/A	Full
Downtown Reno Redevelopment Plan	N/A	Full
Truckee River Corridor Development Plan	N/A	Full
Southeast Truckee Meadows Policy Plan, 1982	N/A	Full
Master Plan for Growth Management City of Sparks, Nevada, 1980	Full	Non-Compliance

1/ The Compliance Categories are based on the following definitions:

a. Full Compliance Having met all requirements of the statute, E.O. or other environmental requirements for the current stage of planning (either pre- or post-authorization).

b. Partial Compliance Not having met some of the requirements that normally are met in the current stage of planning.

c. Non-Compliance Violation of a requirement of the statute, E.O. or other environmental requirement.

d. Not Applicable No requirements for the statute, E.O. or other environmental requirement for the current stage of planning.

2/ For this stage of planning.

2.0 Need for Project and Objectives of Action

2.1 Study Authority The Truckee Meadows Investigation was authorized by the 7 February 1964 resolution of the Committee on Public Works of the United State Senate, with particular reference to providing additional flood protection to Truckee Meadows at and below Reno. The investigation was suspended in fiscal year 1970 due to lack of support, but was later resumed in 1976 at the request of Washoe County and the Cities of Reno and Sparks. The studies resulted in eight alternative plans which were presented at a public meeting in July 1980. The plans evaluated in this report were developed from those eight alternatives.

2.2 Public Concerns Public needs identified include flood protection for businesses and residential areas and recreation opportunities along the Truckee River. Concerns expressed consisted of the following: (1) potential detrimental impacts on the habitats of the endangered cui-ui and threatened Lahontan cutthroat trout; (2) loss of the remaining riparian habitat; (3) loss of remaining marsh and other wetland areas due to flood protection and further expansion of residential areas; (4) detrimental impacts on the local recreation facilities and the plans for future facilities; (5) removal of Virginia Street Bridge; and (6) effect of flood control improvements on flows below Vista.

Opportunities for resource management associated with construction of the selected plan could include additional recreation facilities along the Truckee River and Steamboat Creek, spawning habitat improvement in the Truckee River, establishment of native riparian trees between the levees and the river, and preservation of open space.

2.3 Planning Objectives The primary objective of the investigation is to contribute to national economic development by providing improved flood protection to the Reno-Sparks Truckee Meadows area. Additional objectives include fish and wildlife habitat protection, mitigation and enhancement, and enhancing recreational opportunities.

3.0 Alternatives

This section presents the plans eliminated, the two alternatives under consideration, and a tabulation of comparative impacts. A detailed description of these impacts and potential means of minimizing these impacts is provided in Section 5 of this report.

3.1 Plans Eliminated from Further Study A broad array of flood control alternatives has been evaluated. The plan formulation chapter of the Feasibility Report describes in detail the screening and evaluation of the alternatives.

Many of the alternative plans were eliminated because of inability to control flooding to the level desired, environmental problems, geologic problems, and/or high construction costs making the plan economically infeasible. Table 2 shows the reasons for elimination.

3.2 Plans Considered in Detail The final alternative plans considered in detail are the no action plan and channel-levee plan. The channel-levee plan was refined into the levee plan with detention basin, as described below, based upon optimum level of flood protection, minimizing fish and wildlife impacts, and preventing greater than preproject downstream flood flows.

TABLE 2

REASONS FOR THE ELIMINATION OF ALTERNATIVES

PLAN	INADEQUATE FLOOD PROTECTION	GEOLOGIC CONSTRAINTS	ECONOMIC INFEASIBILITY	FISH & WILDLIFE CONSTRAINTS
Non-structural	X		X	
Lawton Dam & Reservoir			X	
Verdi Dam & Reservoir (SPF)			X	
Verdi Dam & Reservoir (100-year)			X	
Hirschdale Dam & Reservoir	X		X	X
Truckee Dam & Reservoir	X		X	X
Gateway Dam & Reservoir	X		X	X
Reservoirs on Truckee River Tributaries above Reno	X		X	
Steamboat Ditch Bypass Channel			X	
Bypass Tunnel from Truckee River near Hunter Creek to Huffaker Hills Reservoir		X	X	
Bypass Tunnel from Truckee River near Fleish to Huffaker Hills Reservoir		X	X	
Standard Project Flood Channel - Levee Plan with Bypass Tunnel				X

No Action Plan With this alternative, the Federal Government would take no action to alleviate flood problems. Selection of this alternative would result if a local sponsor does not provide assurances for items requiring non-Federal participation.

Adoption of the no Federal action alternative would not prevent local interests from controlling flooding in the Truckee Meadows area. The State of Nevada can be expected to continue periodic channel maintenance. This would generally be limited to a few in-channel shoals with major bank protection work estimated to occur only every 25 years. Washoe County and the cities of Reno and Sparks are currently participating in the Flood Insurance Program administered by FEMA. The program requires these entities to adopt and enforce FEMA standards for development in the flood plain. New regulations prohibit any new development in the designated floodway which cause a 1 foot rise in the water surface elevation under existing conditions in the floodway (Lenaburg, pers. comm). This would effectively preclude any new development in the designated floodway. At this time, publication of the FEMA designated floodway is pending. Preliminary information indicates that the floodway could include areas which are now being developed or planned for development, including the industrial area in Sparks (Crowe, pers. comm.). Within the remainder of the 100-year flood plain, new or improved structures will be floodproofed to the 100-year flood level. However, due to the extensive existing development not governed by flood plain restrictions, future floods would continue to cause significant damage in the study area.

Levee Plan with Detention Basin (Selected Plan) Flood protection to the 100-year level would be provided primarily through bridge replacements, setback floodwalls, floodwalls, setback levees, channel excavation in four isolated areas, and an overflow detention area. The following is a detailed description of these proposed structural activities beginning at the western or upstream end of the project area and proceeding downstream to the Vista area; then continuing up the Steamboat Creek drainage through the University of Nevada Agricultural Experiment Station south of the Truckee River for about 3 miles:

1. Floodwalls and setback floodwalls would be constructed or reconstructed along the north bank between Booth Street and Lake Street, and between Washington Street and Lake Street on the south bank.

2. Bridges would be reconstructed and replaced at or above grade at Arlington Avenue, Booth, Virginia, Center, Lake, and Sierra Streets. The foot bridges at Wingfield Park would also be elevated.

3. Channel excavation is proposed along the north bank in the vicinity of Booth Street Bridge, and excavation would also take place through the stream channel to a maximum depth of 1.5 feet from just above Arlington Avenue Bridge to just above Sierra Street Bridge. The total river distance involved is approximately 1,600 feet.

4. From Kietzke Lane to Glendale Avenue floodwalls are planned for the south bank only.

5. The North Truckee Ditch diversion dam just above Glendale Avenue would be reconstructed and realigned.

6. Between Glendale Avenue and South Rock Blvd. there would be setback floodwalls and setback levees.

7. Between South Rock Blvd. and South McCarran Blvd. there would be setback floodwalls, floodwalls at the river's edge, and setback levees.

8. In the area of Glendale Park, 5.6 acres along the north bank would be excavated above the water surface elevation of the Truckee River at the 1,000 cubic feet per second (cfs) discharge (estimated average annual flow).

9. Between South McCarran Blvd. and the east end of the project at Vista, setback levees would be built on both sides of the river. These levees would be approximately 11 feet high and 82 to 90 feet wide at the base.

10. From the confluence of North Truckee Drain (NTD) and the Truckee River, backwater levees will be built along NTD to approximately 900 feet North of I-80 crossing.

11. Immediately east of the University of Nevada's building on South McCarran Blvd., a 1,000-foot overflow weir would be built and approximately 7 acres excavated from the south bank of the Truckee River and adjacent agricultural land.

12. The University of Nevada Agricultural Experiment Station area would be surrounded by 10 foot levees and serve as an overflow area to temporarily store peak flows of floods greater than a 35-year event. This detention basin is intended to preclude increased flood peaks for areas downstream of the project. Approximately 18,700 feet of levee would be built south of the Truckee River to form this feature. An overflow weir and low level outlet structure would be located along the east side levee to release flows back into the Truckee River.

13. Levees with an average height of 10.5 feet would be constructed along Steamboat Creek and Boynton Slough. Pembroke Drive bridge over Steamboat Creek will be replaced with a causeway bridge system approximately 2,300 feet long.

14. The project features have been designed to allow floodwaters in excess of design capacity to escape the river safely at predetermined locations. This will prevent overtopping and levee failure and will route the excess floodwaters to the same areas as without the project. Also, drainage provisions are included to evacuate excess ponding behind protective works.

This alternative would provide additional recreation facilities along the Truckee River and in the Meadows area. The recreation plan is composed of a mix of multi-purpose day use facilities: bike and pedestrian paths, river overlooks, public seating areas, fishing/river access, picnic sites, and a marsh nature area. Approximately 14.4 miles of bike and pedestrian paths would link existing and planned recreation areas or continue trail access in the study area. The seven new access sites and improvements to existing

Riverside park and to the Riverwalk area in downtown Reno primarily to provide facilities for fishing, swimming, rafting/tubing and picnicking. The Corps of Engineers recreation plan could assist in implementing the planned recreation facilities for Reno's Downtown Redevelopment Plan and Truckee River Corridor Development Plan along the Truckee River. The 300-acre Steamboat Marsh Nature Area would be an environmental interpretation area where the marsh would be managed for fish and wildlife. A bike/pedestrian path will skirt the periphery of the marsh and connect to Washoe County's proposed Huffaker Hills Park.

3.3 Comparative Impacts

Table 3 provides a summary of the impacts of the no action and selected plan alternatives. Section 5.0 discusses the environmental effects in detail.

TABLE 3: COMPARATIVE IMPACTS OF ALTERNATIVES

Base Condition and Alternatives	Hydrology	Water Quality
Base Condition	14,000 to 6,000 cfs capacity. Truckee Meadows natural storage area.	Exceeds some Federal standards. Sedimentation minor problem.
No Action Alternative	Decreased natural storage and higher peak flows below Vista.	Adverse impacts on water supply and sedimentation due to flooding and increased urbanization.
Levee Plan With Detention Basin (Selected Plan)	Near natural storage with detention basin. Flows below Vista maintained at existing levels.	Potential for short-term decline in water quality and increased sedimentation.

Base Condition and Alternatives	Riparian Vegetation	Wetland Vegetation	Fish
Base Condition	223 acres on river and tributaries.	76 acres marsh. 750 acres seasonally flooded.	12 miles (129 acres) fish habitat in Class I and II Fishery. Successful spawning in cooler water upstream from McCarran Boulevard. Limited fishery in Steamboat Creek.
No Action Alternative	223 acres.	Significant portion of seasonally flooded land developed. Further encroachment on marsh.	Temporary degradation to 87 acres of fish habitat from local channelization. Temperature problems for cold water fish below Steamboat Creek (average flows) or Kietzke Lane bridge (drought year flows).
Levee Plan with Detention Basin (Selected Plan)	Short term loss of 23.2 acres. Acreage replanted would exceed vegetation loss.	120 acres of marsh. Impact 2.6 acres lost. Premanent preservation of marsh and overflow area. Enhancement of wetland values. Continued seasonal flooding.	Short-term degradation to 49 acres of fish habitat and temporary movement of fish. Long-term temperature improvements possible with proposed mitigation and enhancement.

TABLE 3 (cont'd.): COMPARATIVE IMPACTS OF ALTERNATIVES

Base Condition and Alternatives	Riparian Vegetation	Wetland Vegetation	Agricultural Land
Base Condition	Significant populations of small mammals and birds in riparian and wetland areas.	Small population of Lahontan Cutthroat trout. Cui-ui habitat downstream of study area.	13,000 acres. 723 acres of prime farmland.
No Action Alternative	Wildlife populations will decrease due to urban encroachment.	Will depend on FWS recovery success.	4,840 total acres of non-urban land left by year 2000
Levee Plan with Detention Basin (Selected Plan)	Temporary decreases in wildlife habitat. Long-term enhancement due to preservation and management of wetland vegetation.	Potential temporary minor adverse impacts due to increased water temperatures and sedimentation.	20.6 acres of prime farmland lost. Agricultural losses due to flooding reduced.

Base Condition and Alternatives	Recreation	Esthetics	Cultural Resources
Base Condition	13 parks, walkways and access easements.	River and wetlands primary esthetic assets.	6 prehistoric sites. Bridge recorded on National Register of Historic Places (NRHP) and 6 recorded by Nevada Historical Society.
No Action Alternative	Use will increase.	Values along river will increase, but decrease in Meadows.	Continued loss to development. NRHP bridge may be removed.
Levee Plan with Detention Basin (Selected Plan)	Short-term adverse impacts due to construction activities. Long-term increase in recreation facilities on river and the Meadows.	Short-term adverse impacts due to riparian removal and construction activities. Enhanced values due to riparian vegetation plantings and management of marsh.	Loss of NRHP structure and 6 recorded bridges. (includes NRHP bridge)

4.0 Affected Environment

4.1 Environmental Conditions This section provides a brief overview of the study area's natural and human resources, with a more detailed discussion of the significant resources that would be affected by the alternatives in Section 4.2. Further information on environmental resources is available in the Stage 2 Report and Alternatives Environmental Working Paper prepared in 1979 by the Corps of Engineers.

The study area includes the Truckee Meadows and Reno-Sparks metropolitan areas which lie at the base of the east slope of the Sierra Nevada Mountains within Washoe County. The Truckee River flows from Lake Tahoe down the east slope, through downtown Reno and Truckee Meadows, and on eastward to Pyramid Lake. The study area has a mild, semi-arid climate. Floods in the Truckee River Basin can be divided into three distinct types: general rainfloods, cloudbursts, and snowmelt floods. The topography is relatively flat, and much of the Meadows becomes a flood plain for tributary streams. Truckee Meadows is in violation of National Ambient Air Quality Standards for carbon monoxide and particulate matter. Automobiles have been identified as the major source of hydrocarbon and carbon monoxide emissions while dust categories (e.g., construction and automobile traffic) have been identified as the major source of particulate matter emissions. Soils in central Reno consist primarily of Pleistocene glacial outwash with subsoils of clays and clayey loams, and the remainder of Truckee Meadows are composed of recent alluvium made up of fine loamy soils with high organic content. Vegetation types, including riparian, desert shrub, alkali or saline meadow, and irrigated farmland, support a diversity of wildlife. The Truckee River in the study area supports both native and introduced game and nongame fish species. The Truckee River within Nevada is third only to Lakes Meade and Mohave in recreation days spent fishing in Nevada and is the most popular stream fishery in the State. Much of the flood plain has been developed to urban uses. Other land uses include agriculture and recreation. The agricultural and open space areas in southeast Truckee Meadows are undergoing a rapid transition to urban uses. Major industrial expansion is planned for the northeast section of the flood plain in Sparks. Reno and Sparks had 1980 populations of 100,756 and 40,780 respectively. The Reno Standard Metropolitan Statistical Area, which encompasses the study area, is one of the fastest growing locations in the west. The rapid growth is an economic phenomena related to growth in employment opportunities in the area's two most important sectors -- gaming-based tourism and warehousing and distribution activities.

4.2 Significant Resources The following discussion covers the significant resources identified by laws, agencies, private groups, and technical criteria (i.e. scarcity, fragility, tolerance, etc.) that would be affected by any of the alternative plans. Those resources not in the discussion are considered either insignificant or impacts would be nonexistent or minimal.

Hydrology The Truckee River accounts for 75 percent of the inflow to the Truckee Meadows. The balance of inflow comes from the various tributaries including Steamboat Creek which is the largest tributary to the Truckee River (EPA, September 1980). Flows above Reno are partially regulated by reservoirs on Stampede, Boca, Prosser, and Martis Creeks and Lake Tahoe. The Truckee is a pool and riffle type perennial stream. The channel bed is armored with materials ranging in size from pebbles and cobbles to boulders (HEC, July

1982). Gravel bars currently exist in the center of the channel and in the lee of the bridge piers which supports the conclusion that the Truckee River through downtown Reno is currently aggrading. In-channel capacity is restricted by inadequate width and constrictions at bridge crossings (Leeds, Hill & Jewett, March 1982). Current design flow of the Truckee River through downtown Reno is 14,000 cfs and 6,000 cfs in the downstream portion of the study area. Flows in excess of these discharges create periodic flooding. The area between McCarran and the eastern foothills is a natural storage area when high flows are experienced in the Truckee River and Steamboat Creek. Most of the groundwater recharge is from seepage of water distributed and applied for agriculture and percolation in stream channels with some recharge directly from infiltrated precipitation (EPA, September 1980). Truckee Meadows is the major ground water basin in the Truckee River drainage.

Water Quality Water quality of the Truckee River is good at the higher elevations where human influence is minimal. The water quality changes as the river flows through Reno/Sparks and the Truckee Meadows. Sources of pollutants in order of importance are the Reno-Sparks Wastewater Treatment Facility (WWTF), urban stormwater runoff, and agricultural return flows (Reno City Planning Department, 1981). Associated with this is increased water temperature, reduced dissolved oxygen, and accumulation of finer bottom sediments (EPA, September 1980). Sedimentation is not currently a major water quality problem in the study area. It is estimated that about 61,400 tons of sediment are deposited in the Truckee River near Truckee Meadows annually. The lower portion of the Truckee River below Vista is a much higher sediment producer than the upstream portion (HEC, July 1982).

Riparian Vegetation Although riparian (stream bank) vegetation is significantly less than under conditions existing prior to the turn of the century, the Truckee River still supports one of the principal riparian corridors in the state. The removal of riparian vegetation is attributable to activities spanning the last 100 years including commercial harvesting, bank protection and levee construction, erosion of banks, overgrazing, and farmland clearing. There are currently an estimated 223 acres of riparian habitat on the Truckee River and tributaries within the study area. The remnant vegetation consists primarily of black cottonwood, Fremont cottonwood, red and sandbar willows, white alder, and Oregon ash. The mature riparian vegetation occurs in narrow, intermittent stretches along the banks and levees of the Truckee River. In some segments, particularly along the bike paths and riverbelt parks, ornamental species have replaced indigenous species. Only small patches of willows occur along Steamboat Creek and Boynton Slough.

The riparian vegetation supports an important wildlife community. Many species of birds, including species listed on the Audubon Society's Blue List of declining species, inhabit riparian areas for a portion of their life cycle. The riparian vegetation is essential to the fishery in terms of providing terrestrial insect drop, an important food source for the fish, nutrients for the aquatic invertebrates from falling leaves and branches, and protective cover for the fish. Shading from the trees is important in lowering water temperatures. The riparian vegtation also provides habitat for many species of mammals.

Wetland Vegetation The wetland vegetation along Steamboat Creek and Boynton Slough have been identified by FWS as important wildlife resource areas. (FWS, June 1981). Marsh vegetation in the area around the confluence

of Steamboat Creek and Boynton Slough consists of bulrush, cattail, spikerush, Baltic rush, and pondweed. Seasonally flooded meadow between the confluence and Huffaker Hills is comprised of sedges, Baltic rush, bluegrass, and introduced range grasses. These wetland areas are good habitat for a number of small mammals and a variety of birds, some of which are on the Audubon Society's Blue List of declining species. The permanent marsh vegetation covers about 55 acres, and the seasonally flooded areas adjoining the marsh cover about 750 acres. Steamboat Creek is the major source of water to the marsh. Boynton Slough downstream of McCarran Boulevard supports about 21 acres of wetland vegetation. Until 1979, seasonally flooded vegetation provided about 1,000 acres of habitat, but housing developments have encroached into this wetland area.

Fish The fish of the Truckee River comprise 8 families and are composed of 28 species. Twelve species are sought after game fish of the area. There are about 129 acres of Truckee River bottom habitat within the study area. The Lahontan cutthroat trout and cui-ui are discussed under Endangered Species. The Truckee River from the California stateline to the confluence with Steamboat Creek is classified as a Class I fishery (Highest Valued Fishery Resource) and from the confluence of Steamboat Creek to Derby Dam as a Class II fishery (High Priority Fishery Resource). Steamboat Creek (Boynton Slough to Truckee River) is classified as a Class III and IV fishery (Substantial to Limited Fishery Resource). The classifications were determined in a cooperative effort by FWS, Nevada Department of Wildlife, and the Environmental Protection Agency.

The Nevada Department of Wildlife (NDW) regularly plants the Truckee River with rainbow and brown trout, and recently cutthroat trout. Rainbow and brown trout have done best, but all must be aided by supplementary plants (NDW, 1982). Ponds in the Truckee Meadows have been stocked with black crappie, yellow perch, large-mouth bass, and bluegill.

Salmonid spawning areas are found in a number of locations within the Truckee River. Salmonids have been observed spawning in the vicinity of Sierra Street Bridge (brown trout), Center Street Bridge (rainbow trout) and the Donner Trail Bridge (brown trout and mountain whitefish). Studies indicate little evidence of successful spawning downstream from McCarran Boulevard in the Truckee River (FWS, 1982). A nursery area is located at the Rock Boulevard Bridge (brown trout) (FWS, June 1981). During flow periods in the summer months, water temperatures in the river can increase sufficiently to displace trout and other cold water fish and to temporarily result in movement of warm water fish from the lower reaches of the Truckee into the study area.

Wildlife The riparian and other wetland habitats are occupied by a variety of wildlife species. Species listed on the Audubon Society's Blue List of declining species are denoted by * (Arib, 1979). Species listed on the FWS National Species of Special Emphasis which lists fish, wildlife, and plant species of special biological, legal, or public interest are denoted by +. Mourning doves+ and yellow warblers* nest in riparian vegetation, and ash-throated flycatchers require old riparian trees with cavities for nests. Warbling vireos utilize dense tree foliage for nest sites. Cliff, bank and rough-winged swallows feed over the river where flying insect habitat is abundant. The belted kingfisher is a year-round resident and feeds on small fish. Waterfowl, including Canada goose+, mallard+, pintail, teal,

canvasback+, and redhead+ utilize the Truckee River corridor and lower Truckee River in sufficient numbers to support limited hunting.

The wetland areas provide wintering, migrating, and resident habitat for approximately 18 species of shorebirds. Major nesting species include killdeer, spotted sandpiper, willet, Wilson's Phalarope, and long-billed curlew. Other species include the greater yellowlegs, least sandpiper, and snowy plover*. The 55 acres of marsh and immediate area provides nesting habitat for production of about 60 Canada geese and 360 ducks hatched annually. Annual waterfowl use days (excluding geese) is estimated at 100,000 (number of birds multiplied by days present).

The close proximity of marsh, seasonally flooded meadow, and agricultural land produces significant rodent populations which makes the Truckee Meadows attractive to the raptors: barn owl, short-eared owl*, marsh hawk*, rough-legged hawk, ferruginous hawk*, and American kestrel. The wetland areas are also excellent habitat for the black-crowned night heron*, great blue heron, long-billed marsh wren, red-winged blackbirds, and sora and Virginia rails.

FWS lists four birds occurring in the Truckee Meadows which are "sensitive" species (those which could become Federally listed as threatened or endangered in the foreseeable future): white pelican, Swainson's hawk, willow flycatcher, and loggerhead shrike.

The Truckee River and tributaries provide habitat for beaver, muskrat, and river otter. Steamboat Creek is one of only two locations where mink are found in Washoe County. Some deer have utilized the Truckee Meadows near the lower end of Steamboat Creek. The meadows, marshes and riparian areas provide habitat for small mammals such as the dusky shrew, western jumping mouse and longtail vole. The small mammals provide most of the food for predators such as weasels and hawks. The 16 species of bats within the study area feed on flying insects and ground beetles.

Endangered Species In accordance with Section 7 of the Endangered Species Act of 1973, FWS has identified two listed species -- the threatened Lahontan cutthroat trout (Salmo clarki henshawi) and the endangered cui-ui lake sucker (Chasmistes cujus).

Several other endangered or threatened species may occasionally occur in or near the study area, but were not identified as species of concern by FWS. A brief discussion of these species follows. The endangered bald eagle winters along the Truckee River but is not resident and would only pass through or occasionally forage in the study area. The endangered peregrine falcon occasionally uses the river area during migration. The river and marsh habitat provide a foraging area for the peregrine falcon. Although no endangered plant species are known to exist within the study area, both the State of Nevada and FWS recognize plant species in the general vicinity of the study area which are of limited distribution. A list of candidate species published by FWS in 1980 is shown in Table 4.

Table 4*

Plant Species of Limited Distribution

Common Name	Scientific Name	Status Nevada[1/]	Status Federal[2/]
Nevada evening primrose	Camissonia nevadensis	RC	2
Andesite buckwheat (Granite Eriogonum)	Eriogonum lobbii robustum	RT	1
Jawleaf lupine	Lupinus malacophyllus	RC	2
Beatley five-leaf clover	Trifolium andersonii beatleyae	RC	2

*from Federal Register, 15 December 1980; Pinzl, January 1981; U.S. Air Force, 22 December 1980.

1/ RC - Recommended as a species of special concern.
RT - Recommended for threatened status.

2/ The candidate species are classified into two categories:
Category 1 - Taxa for which FWS has sufficient information to support the biological appropriateness for listing as Endangered or Threatened.
Category 2 - Taxa for which existing information indicates the probable appropriateness for listing, but that information is not sufficient to support a proposed rule.

The Lahontan cutthroat trout is a member of the complex rainbow-cutthroat trout assemblage of fishes. At one time, it occupied the Truckee, Carson, and Walker River drainages, including Pyramid Lake, Walker Lake, Lake Tahoe, Donner Lake, Independence Lake, and Summit Lake. Obligatory river and stream spawners, the Pyramid Lake Lahontan cutthroat trout historically ran up the Truckee River and its major tributaries to Lake Tahoe. Lack of instream flows, instream barriers, and probably poor water quality led to extinction of the wild, naturally reproducing population. Lahontan cutthroat trout have been reintroduced to Pyramid Lake and are maintained through fish hatchery operations. Marginally self-sustaining populations of the fish currently exist only in Independence Lake, which is part of the Truckee River system, and Summit Lake, an isolated lake in Nevada. Suitable habitat for the trout still exists in the Truckee River throughout the study area with the best spawning gravels occurring within the Reno area. Reproductive success with Lahontan cutthroat trout has been achieved in the Truckee River above Verdi, but not in the downstream reaches. The presence of 648 Lahontan cutthroat trout from Verdi to Vista in a count taken in 1977 was attributed to releases for a juvenile emigration study conducted in 1976 by FWS. In 1982, the Nevada Department of Wildlife (NDW) released over 4,000 cutthroat trout into the Truckee River for sport fishing.

To date, the recovery efforts for Lahontan cutthroat trout have met with minimal success. Hatchery reared cutthroat trout are not imprinted to the Truckee River; hence they are not attracted to the river during spawning migrations. It is also believed that water temperatures below Derby Dam are now seasonally too warm for successful trout spawning and use as a nursery habitat for fry. The stocking program in Pyramid Lake has met with good success, even though the lake currently supports only a fraction of the cutthroat trout it supported when the population was maintained by natural reproduction. A Lahontan cutthroat trout recovery plan is currently being prepared. It is the firm goal of the FWS to re-establish a self-sustaining population in Pyramid Lake and throughout the Truckee River (FWS, 1982). The cutthroat trout is considered a game fish by the State of Nevada and the Nevada Board of Wildlife Commissioners advocates removal of the species from the threatened list.

The cui-ui is a lake-sucker endemic to Pyramid Lake and, before its decline, an important food fish for the Paiute Indians. Historically, the cui-ui used the lower Truckee River as its principal spawning grounds and is reported to have ascended the Truckee as far as McCarran Ranch (located between Vista and Derby Dam) to spawn. Construction of diversion dams in the Truckee River, high water temperatures, and water pollution drastically reduced cui-ui populations. Since then, limited cui-ui reproduction has continued in Pyramid Lake and the lower Truckee River through the Pyramid Lake Fishway. The numbers of cui-ui have been supplemented by release of millions of hatchery fry into the lower Truckee and Pyramid Lake . There is no evidence of cui-ui above Derby Dam, and the cui-ui is not known to have historically occurred as far upstream as the study area.

Recovery efforts for the cui-ui were actively begun in 1973 by FWS and the Pyramid Lake Paiute Tribe. Specific objectives are detailed in the Cui-ui Recovery Plan adopted in 1978. To assist in this, the Pyramid Lake Fishway, Marble Bluff Dam and Marble Bluff fishway were constructed in 1975 to provide an avenue for upstream fish passage. Also, a fishway was completed on the Numana Dam, restoring access for spawning on the lower river. In 1981, cui-ui

were observed spawning in the Truckee River for the first time in 40 years (FWS, June 1981).

Agriculture Agricultural land and productivity have declined significantly in the Truckee Meadows due primarily to urbanization. In 1978, it was estimated that only 13,000 acres of irrigated land remained in the Truckee Meadows. Cattle grazing and alfalfa hay are the major agricultural uses. By the year 2000, only small pockets of agricultural land are expected to remain (Regional Administrative Planning Agency, 1982).

The largest continuous acreage under cultivation is east of Cannon International Airport. The largest acreage adjacent to the river is the University of Nevada Agricultural Experiment Station.

Prime farmland, as identified by the Soil Conservation Service, occurs mostly on lands adjacent to the south bank and totals 723 acres within the study area. The State of Nevada also designates these lands as "Important" under the Farmland Protection Act of 1982. "Important" farmlands are considered to be any agricultural lands with a full or partial source of irrigation water.

Recreation Parks, access areas, and pedestrian/bicycle paths along the banks of the Truckee River and in the Truckee Meadows area provide facilities for fishing, swimming, rafting/tubing access, picnicking, bicycling, jogging, and general enjoyment of the river. Approximately 1.8 million recreation use days occur annually along the Truckee River in the study area. In 1978 about 227,000 angler days were spent along the Truckee River from the California border to Wadsworth (EPA, 1980). Recreation facilities have been developed by the City of Reno and the City of Sparks. Additionally, a greenbelt/riverbelt with public access borders sections of the river on both sides from Verdi to Vista. The following are the facilities from the western city limits to the east, which are under the jurisdiction of the Reno Department of Parks and Recreation:

Crissie Caughlin Park
Ivan Sack Park
De Loretto Walkway
Doyle Island Park (near future)
Dickerson Road Public Access
Idlewild Park
Water's Edge Walkway
Riverside Bicentennial Park and Riverbelt Park
Wingfield Park
West Street Plaza
Island Avenue Public Alley
William Broadhead Truckee River Lane Public Alley Park
Kuenzli Riverbelt Fishing Access
Harrah's Walkway
Gazette/Journal Walkway
Fisherman's Park
MGM Walkway
Mira Loma Park

The City of Sparks has included the entire 6 miles of the north bank of the Truckee River within its city limits as a greenbelt park. To prevent

further encroachment on the river, Sparks adopted an ordinance restricting development within 150 feet of the river. A pedestrian/bicycle trail extends from Fisherman's Park to Vista and provides a link between four developed parks: Fisherman's Park, Rock Park, Glendale Park, and Cottonwood Park.

A number of recreation plans have been adopted or are under study which will affect future recreation development in the study area. The Open Space Plan adopted in 1974, envisions a continuous greenbelt along the river from Verdi to Vista and identifies potential developed areas (many of which have since been developed). Reno is currently revising and expanding its recreation plans. Reno owns 60 percent of the river banks within the city limits. At present, the City is attempting to acquire properties as parcels abutting the river are developed. However, the potential for additional park property along the river is limited (Reno Planning Dept., 1981). The Truckee River Corridor Development Plan is in the preliminary planning stages. The plan would provide a pedestrian/bicycle link with the existing trail from Crissie Caughlin Park to Arlington Avenue downtown, and from East Second Street to the eastern Reno city limits. A series of river access sites/parks along the river would be connected by landscaped pedestrian/bicycle paths and bridges. The Downtown Reno Redevelopment Plan which is under study would make the Truckee River the focus of a beautification program. Concepts currently being considered include a river walkway featuring viewing areas, public seating areas, "retail gardens" adjacent to the walkway, a multi-level "River Room" which would merge the existing post office into a major retail-tourist center, various esthetic treatment (lights, reflecting pools, fountains), and extensive landscaping. The City is also considering alternatives for creating a mall on Virginia Street. The City of Sparks proposes to develop a small river access site near Franklin Way. Washoe County has no current plans for development along the river within the study area; however, it does plan to develop recreation facilities in the Truckee Meadows area comprised of a park at Pembroke Drive and Steamboat Creek and a trail link from the County's planned Huffaker Hills Regional Park to the Meadows area.

The ponds and creeks of Truckee Meadows provide fishing opportunities. The riparian, marsh, meadow and desert scrub habitats provide bird watching and nature photography (COE, November 1979).

Esthetics The esthetic importance of the Truckee River is given high priority in a number of plans and policies adopted by planning jurisdictions within the study area.

In the arid Truckee Meadows, scenic resources center around the water and include both the Truckee River and Steamboat Creek. Esthetic resources associated with the Truckee River include the vegetation and wildlife which it supports and the perception of "natural" areas in an increasingly urbanized setting. Esthetic resources are concentrated in existing parks and riverbelts along the Truckee River. The river is a significant amenity to a number of residential areas which overlook or border its course. Although development in downtown Reno has encroached on the river, the river offers important visual relief from the congestion and intensely developed nature of the casino-commercial complex. Greenbelt development adjacent to the Sparks industrial area is an important esthetic asset.

Development adjacent to the river and channel improvements have reduced the esthetic qualities of the river, primarily due to removal of native

vegetation and visual intrusion of incompatible uses. In some segments, debris on the banks and in the channel make the river unsightly.

Portions of Steamboat Creek and the surrounding marsh and agricultural land also offer visual diversity in terms of the vegetation and wildlife they support and the feeling of open space.

Vistas from and toward topographical features such as Rattlesnake Mountain, other parts of Huffaker Hills, and the mountains surrounding the Truckee Meadows are major viewpoints in the study area.

Cultural Resources A preliminary literature review of the cultural resources of the study area has been completed. Should a project be authorized for advanced engineering and design, a more detailed cultural resources investigation would be undertaken. The most extensive field survey in the Truckee Meadows was conducted by Elston in 1967. Thirty-one prehistoric sites were recorded, of which six are within the study area (Elston & Turner, 1968).

Archeological evidence suggests the earliest prehistoric occupation dates back to circa 6000 BC (Tahoe Reach and Spooner Archeological Phases - 6000 BC to 2000 BC). In the Early Martis-Late Spooner Phases (circa 1500-2000 BC) the predecessors of the present day Washoe Indians settled in the Truckee Meadows area. The Kings Beach phase followed Martis and continued to historic contact (AD 1200- historic contact). The abundant winter wildlife and other food sources made the area around Truckee Meadows a favored location of the nomadic Washo for major winter villages.

The first recorded mention of the Truckee River occurred in the journals of John C. Fremont who crossed the river at present day Wadsworth in 1844. In 1844, the Stevens-Murphy emigrant party followed the Truckee River into California, establishing what later became an important overland route. The Washoe Valley and Truckee Meadows were thus known to the earliest emigrants going to California, and was a major route during the 1849 Gold Rush. The first permanent settlement in Washoe County was Jameson's Trading Post and Station on the Truckee River. Myron Lake purchased a crossing over the Truckee in 1861, later known as Lake's crossing, and now the site of the Virginia Street Bridge. Lake established the townsite of Lake Crossing, the birthplace of the City of Reno. The completion of the transcontinental railroad was a significant factor in the growth of Washoe Valley, as was a highway system completed after World War I. The Arlington, Booth, Lake, Center, Virginia and Sierra Street Bridges in downtown Reno have been recorded by the Nevada Historical Society. Of these, only the Virginia Street Bridge has been listed in the National Register of Historic Places.

Engineer John B. Leonard's design for the Virginia Street Bridge was selected from several that were submitted in 1905. It was the first reinforced concrete bridge constructed in the State of Nevada. Not only does it provide a focal point in Reno but it represents the engineering state-of-the-art and architectural style of its time.

5.0 Environmental Effects

The environmental effects of the selected plan and the no action alternative are presented below. Mitigation and enhancement measures are included in the following discussion of plan impacts and summarized in Section 5.3.

5.1 No Action The Federal Government would take no action to alleviate flood problems. Adoption of this alternative would not preclude local interests from reducing flood damages in the study area. This alternative assumes continued channel maintenance and participation of Washoe County, Reno, and Sparks in the Flood Insurance Program. The Federal Government would continue to participate in emergency work as authorized by Public Law 84-99. The following summarizes future "without project" conditions anticipated in the study area.

Hydrology Hydrological conditions will depend on channel modifications or improvements provided by non-Federal interests and the effects of future flooding and development in the flood plain. Encroachment on the flood plain will decrease natural storage and create higher peak flows below Vista. Groundwater recharge can be expected to diminish with future urbanization of the flood plain (Reno Planning Dept., 1981 and EPA, 1980).

Water Quality The expansion and upgrading of the Reno-Sparks Wastewater Treatment Facility is expected to improve water quality in the river. Increased urbanization and accompanying runoff will increase pollutant loads in the Truckee River and Steamboat Creek. Flooding will continue to pose a hazard of water supply contamination. Sedimentation in the Truckee River within the study area would increase significantly during more serious flooding. Sediment deposits may be as much as 755,000 tons per storm during a 100-year event (HEC, July 1982).

Riparian Vegetation There is public ownership of much of the riverbanks by the Cities of Reno and Sparks and Washoe County. Thus, the overall amount of riparian vegetation is not expected to change due to the cities' and county's commitment to maintain and expand the Truckee River greenbelt.

Wetland Vegetation A substantial portion of the seasonally flooded pasture and other agricultural lands between Huffaker Hills and the Truckee River is expected to be developed in the near future (FWS, October 1979). Although the marsh land cannot be readily developed without extensive flood control protection, proposals have been advanced for subdivision of land in and adjacent to Steamboat Marsh (Crowe, pers. comm.). Recently (since 1979), these proposals have been rejected on the basis of their location in the flood plain.

Fish The fishery in the Truckee River is expected to remain sound due to efforts by the Cities of Reno and Sparks and management by NDW. Water quality improvements and measures implemented by FWS and the NDW will be key factors in the future condition of the fishery. Warm water temperatures downstream of South McCarran Boulevard would likely remain an impediment to trout spawning. Periodic channel maintenance by the State is expected to temporarily disturb about 87 acres of river bottom habitat.

Wildlife Wildlife habitat values on both banks of the river will probably continue to decline due to park development and human use. Species diversity is expected to decline slightly because of loss of understory vegetation, adjacent industrial development, and human disturbance. Urban encroachment into the seasonally flooded lands and permanent wetlands in the Truckee Meadows will significantly decrease wildlife values.

Threatened and Endangered Species Although general fishery conditions are expected to improve, future populations of the cui-ui and Lahontan cutthroat trout will be determined largely by the success of the FWS recovery programs.

Agriculture The major agricultural areas estimated to remain in the year 2000 by the Washoe Council of Governments (WCOG) are in Spanish Springs Valley east of Reno and in the area south of Huffaker Hills. The total amount of nonurban land in the Truckee Meadows was projected by WCOG to decline 80 percent by the year 2000, with only 4,840 nonurban acres remaining in 2000. Agricultural land adjacent to the river, between Rock and McCarran Boulevards, is undergoing conversion to industrial uses. Downstream of McCarran on the south, agricultural land owned by the University of Nevada is expected to be the major area to continue in agricultural use.

Recreation Recreation opportunities along the river are expected to expand with implementation of the greenbelt plan and other plans currently being formulated by the City of Reno and City of Sparks. Encroachment into the Truckee Meadows wetlands may reduce the potential for recreation use of that area. Washoe County has plans for additional park development within its jurisdiction. Recreation facility expansion will be dependent upon available funds.

Esthetics The area of greatest change will be in the lower Truckee Meadows where open space and pasture land are yielding to residential and commercial development. Implementation of current and proposed recreation and beautification plans in downtown Reno and along the river should improve existing esthetic qualities.

Cultural Resources Preliminary plans for the Reno redevelopment project call for replacement or modification of the downtown bridges. No decision has been made on preservation of the Virginia Street Bridge. Continued development of the study areas can be anticipated to result in continued loss of historical and archeological resources.

5.2 Levee Plan with Detention Basin (Selected Plan) The plan consists of floodwalls and bridge replacements above U.S. 395 and levees and floodwalls downstream of U.S. 395. A detention basin and backwater levees would be constructed in the Truckee Meadows. A detailed description appears in Section 3.

Hydrology Excavation of selected river bed locations will improve hydraulic efficiency. A potential for channel bed scouring exists where excavation removes natural armor in the channel. Use of the detention basin would maintain flows below Vista at preproject levels. The detention basin would act as a nearly natural storage area for the higher flood flows which spread out over a larger area under existing conditions.

Water Quality There would be a short-term degradation of water quality during construction from sediment disturbance. This turbidity would be reduced with use of flow diversions, silt screens, and timing construction during low flows.

Riparian Vegetation Construction of the floodwalls, levees, and excavation is expected to remove a total of 23.2 acres of riparian vegetation. Cottonwood and willows would be the dominant species impacted. Riparian vegetation would be removed permanently in some areas due to structure placement and erosion protection needed at excavation sites. Project levees will be aligned to avoid, to the maximum degree possible, mature riparian vegetation habitat so as to minimize loss of river shading. Levees would be planted with grass and forbes. Replanting would be undertaken in areas disturbed and all riparian removal mitigated. The proposed enhancement would involve establishing riparian vegetation along Steamboat Creek (see Section 5.3).

Wetland Vegetation This alternative would protect and enhance emergent wetland vegetation with only a 2.6 acre loss to levees along Boynton Slough which will be mitigated with riparian vegetation plantings. Flows into the Steamboat Creek marsh area will not be affected. The proposed enhancement is acquisition of 300 acres in the Steamboat Marsh and adjoining wetlands as a nature area and management of the wetland vegetation for fish and wildlife (see Section 5.3).

Fish Construction of the flood control features would have a short-term adverse impact on fish habitat. The impacts on cui-ui and Lahontan cutthroat trout are discussed separately. Removal of riparian vegetation will mean a temporary loss of terrestrial insect drop as a food source for the fish and a loss of protective cover. Shade loss will result in a small increase in water temperature as described in Threatened and Endangered Species below. Phasing of construction over a 6-year period, limiting riparian removal, and providing mitigation plantings along the river will result in only an insignificant and temporary adverse impact on the fish resource. The limited in-channel excavation, some of the floodwall placement, bridge replacements, and diversion realignment would involve movement of gravel and boulder fish habitat. The excavation would require removal of 1,600 feet of river bottom. The floodwalls and bridge replacements in the downtown area and realignment of the North Truckee Ditch diversion would require disturbance of bottom habitat. A total of 17 acres of fish habitat would be disturbed. Temporary movement of fish from these areas would occur. The resultant bottom habitat is expected to be similar to existing conditions. Increased turbidity would decrease water quality over an additional 32 acres of river which may cause gill damage and filling in of spawning gravels. Turbidity controls would minimize that potential impact, and the next winter and spring flows would return bottom conditions to normal. Construction of the floodwall on the south bank at the Edison Way business office complex will likely block access to one of nine fish planting sites used by the Department of Wildlife within the study area. The proposed recreation areas would provide access to the river at several additional sites, one at the downstream side of the office complex. The excavation immediately below Wingfield Diversion would produce an impediment to upstream movement by fish because of the resulting diversion structure height. Mitigation would be reconstruction of existing fish ladders.

Wildlife Loss of riparian habitat would cause a decrease in birds and small mammals until regrowth occurs. An increase in wildlife would occur in areas proposed for planting in the mitigation plan. This and proposed enhancement plantings should maintain species diversity above that now existing. Detrimental impacts due to loss of grasses, forbs, and farmland where levee construction is planned is not considered significant as levees will be planted to grasses and forbs, with no net loss. Maintenance of the detention basin in permanent agriculture and acquisition of Steamboat Marsh and enhancement plantings on Steamboat Creek would preserve and enhance wildlife value. The details of mitigation and enhancement are covered in Section 5.3. The additional marsh proposed as part of the Steamboat Marsh Nature Area has the potential to increase the mosquito problem in the immediate vicinity.

Threatened and Endangered Species The selected plan has a potential for impacting the threatened Lahontan cutthroat trout and the endangered cui-ui. Silting of spawning gravel is a potential problem, but turbidity controls and avoiding construction during spawning periods would reduce the problem. The bridge replacements have the potential for temporarily disturbing spawning gravels. Due to the changeable nature of river gravels, further studies will be undertaken prior to construction to identify the actual location of spawning gravels which could be impacted. High water temperature is now a primary obstacle to Lahontan cutthroat trout and cui-ui use of the river. The selected plan could potentially raise the temperature approximately 1.6°F higher than the normal rise under the greatest warming conditions (high air temperature, low river flow) at the downstream end of the study area. Temperature rises in cui-ui habitat, downstream of Derby Dam, would be less but under some conditions could impair spawning success. This impact would be a rare event lasting not likely more than a few days at a time and have the chance of occurring only during the 10 to 15 years required for the shade canopy to become re-established. Once re-established, the selected plan would be beneficial to the recovery of both fish because the mitigation and enhancement proposed would produce lower water temperatures and better water quality than is expected to occur without a project. A biological assessment has been coordinated with FWS and NDW in accordance with Section 7 of the Endangered Species Act. Formal consultation was requested and FWS determined in their biological opinion that construction of the selected plan would not likely jeopardize the existence of the two fish species.

Agriculture Approximately 900 acres of agricultural and seasonally flooded land would remain in permanent agricultural use through acquisition of flowage easements in the planned detention basin. About 20.6 acres of prime agricultural land would be lost to levee construction. Flooding of the University Agricultural Experiment Station would be reduced from the current once in 15 to 20-year event to any flooding exceeding the 35-year event; however, flood waters would enter the detention basin from the west at the inlet weir and existing flooding starts from the east due to backwater effects of the Truckee River and Steamboat Creek. The ongoing experimental plantings in the field laboratory are arranged with the short term on the east and long term on the west. The selected plan would likely require a rearrangement of experiments even though flood protection would be better. Agricultural losses due to flooding would be decreased with this plan. Although flooding of farmland will be less frequent, such flooding will continue to periodically replenish the soil with mineral nutrients from suspended sediment deposition. A SCS Farmland Conversion Rating Form was completed that indicates the site would have a rating of 141 points out of a potential of 260 points using the criteria on form AD-1006 (10-83).

Recreation Adverse impacts would be due to construction activities which will require temporary removal of some existing recreation facilities, but the facilities will be replaced. Approximately 0.4 mile of pedestrian/bicycle paths will be removed by floodwall and levee construction. The two pedestrian bridges at Wingfield Park would be raised. Recreational activities would be prohibited in immediate construction areas for public safety. Fishing success in the river would decrease in areas where construction is ongoing. No Washoe County Park facilities would be disturbed.

Recreation lands and facilities purchased with Land and Water Conservation Fund Act (LWCFA) funds that are converted to other uses must be replaced with equal facilities. None of the City of Reno recreation lands or facilities that would be disturbed were purchased using LWCFA funds. The City of Sparks used LWCFA funds for land acquisition and facility construction of the Truckee River Greenbelt, four parks, and the pedestrian/bicycle path. The Corps, National Park Service (NPS - administrator of the LWCFA), Nevada Division of State Parks, and the City of Sparks have coordinated to minimize and identify conversion of recreation lands to flood control purposes. Conversions would be minimized by aligning most levees and floodwalls off greenbelt and park lands. At Glendale Park the levee would be constructed with relatively flat side slopes so the area would still be useable for recreational activities. The excavation of 5.6 acres at Glendale Park would be a beneficial impact, according to NPS, because of a better view of the river and increased access to the shoreline.

Levees and floodwalls would be placed on a total of 0.98 acre of LWCFA lands at 7 locations from Glendale Park to the downstream end of the levee near Larkin Circle. The City of Sparks and NPS have agreed that the planned 1 acre Franklin Park would be the replacement for these LWCFA lands converted to flood control facilities. Coordination with the city, State Parks, and NPS will continue during detailed studies after project authorization.

The proposed recreation plan is based on planned future facilities by the cities of Reno and Sparks, and Washoe County. Facilities would include parking lots, restrooms, picnic sites, par courses, pedestrian/bicycle paths, and river overlooks. Four existing park and access areas along the Truckee River within the City of Reno would be provided with additional facilities. This includes providing some of the facilities planned for the downtown redevelopment. Three of Reno's proposed new parks are incorporated into the recreation features of the selected plan. One planned new park (Franklin Park) for the City of Sparks and 3 planned parks for Washoe County are included in the recreation plan. Within the City of Reno 3.2 miles of pedestrian/bicycle paths along the Truckee River would be constructed to connect the parks. Two pedestrian/ bicycle bridges would connect Reno's parks to Spark's park system between Rock and South McCarran Boulevards. Washoe County's pedestrian/bicycle paths would connect with Reno's path at South McCarran and continue for another 1.3 miles along the Truckee River. An additional 9.8 miles of path would follow Steamboat Creek south to Steamboat Marsh Nature Area (Section 5.3) and the county's proposed Huffaker Hills park. These new recreation facilities will provide for approximately 717,000 recreation days annually of picnicking, bicycling, jogging, fishing, and rafting/tubing.

Esthetic Construction activities and vegetation removal will cause esthetic degradation until revegetation is completed. The visual effect of

structural improvements is largely subjective. Replacement of old style bridges with new structures may be perceived as diminishing the historical/ esthetic character of the downtown area. Reconstruction of the downtown floodwalls will improve the visual effect compared to the presently deteriorating floodwalls. The reconstructed floodwalls and new floodwalls in the downtown area will be the same height or higher than the existing floodwalls. Construction of new levees and floodwalls downstream of Reno may also be considered by some as a visual intrusion on the "natural" qualities of the river. However, as urban uses border much of the river, grassed levees may actually act as a visual buffer more in keeping with the riverine environment. Planting of indigenous riparian vegetation in areas now devoid of vegetation would significantly enhance esthetic qualities on the Truckee River and along Steamboat Creek. Acquisition of Steamboat Marsh would preserve its esthetic qualities.

Cultural Resources The plan would involve removal of the six bridges recorded by the Nevada Historical Society including the Virginia Street Bridge which is also on the National Register. According to a representative of the State Historic Preservation Office, the Lake, Center, and Sierra bridges may also be historically significant and eligible for the National Register. The inclusion in the selected plan of removal of the bridges is based upon the least costly alternative for providing flood flow capacity in downtown Reno with minimal disturbance to cutthroat trout habitat. Evaluation of alternatives which would allow the bridge to remain will continue to be considered. A number of prehistoric sites have been recorded in the area of proposed levee construction although none appear to be at specific levee locations. As the area has not been systematically surveyed, additional and possibly significant prehistoric sites may be located when detailed studies are conducted after project authorization. Detailed studies will also include evaluations for National Register eligibility of prehistoric and historic sites, such as the bridges and associated retaining walls and light standards. Prior to construction, a mitigation plan will be developed in coordination with the Advisory Council on Historic Preservation and the State Historic Preservation Office.

Other Impacts Construction of new floodwalls and bridges would disrupt existing traffic patterns. The construction season would be April through November. To minimize disruption of traffic flow, one bridge per construction season would be replaced.

The State's Regional Transportation Commission is studying the alignment of the Tahoe Pyramid Link, a highway to connect Highway 80 at Sparks Boulevard to Highway 395 at the Mt. Rose Intersection. Construction of the Link would require straightening portions of Steamboat Creek north of Pembroke Lane. This would lessen the acreage available for enhancement plantings but would not affect the acreage available for mitigation of riparian vegetation. The Link would pass along the eastern edge of the proposed Steamboat Marsh Nature Area but could be compatible provided the selected link alignment is close to the hills and would remove only a minimal amount of the marsh.

The Reno Public Works Department has expressed concern for water loss through transpiration by the riparian vegetation to be planted for mitigation and enhancement. The mitigation would essentially only replace the amount of vegetation lost by the project so there would be no net loss from transpiration. The enhancement along Steamboat Creek would replace vegetation

that evidence indicates occurred in the early 1900's. Also, the shading of the creek would reduce water loss by evaporation.

5.3 Mitigation and Enhancement Mitigation initially involves avoiding and minimizing potential detrimental impacts. The selected plan was designed to avoid riparian vegetation where possible. Floodwalls are incorporated to minimize removal of vegetation and recreation facilities. Where feasible, levees are located away (setback) from the river bank to avoid these resources. To minimize fishery impacts construction will be carried out between spawning seasons. To reduce turbidity associated with construction, sediment buildup behind Wingfield Diversion and North Truckee Ditch diversion dams will be removed by hydraulic dredging prior to removal for excavation and realignment, respectively. Use of silt curtains, flow diversions, and timing of construction during low flows will also reduce turbidity. To minimize disturbance of fish habitat, much of the excavation in the selected plan will occur above the 1,000 cfs flow elevation which is above the river bed habitat.

Mitigation for loss of riparian (23.2 acres) and wetland (2.6 acres) vegetation will be incorporated into the selected plan. Mitigation will include replanting of areas disturbed by construction and planting along other areas of the river now largely devoid of riparian vegetation. The effect of the establishment period for newly planted vegetation will require more acreage to be planted than acreage impacted due to lesser value of the plantings until mature. A total of 31.4 acres of riparian vegetation (cottonwood and willow trees) will be planted to restore wildlife habitat and preclude elevated water temperatures. The majority (25.3 acres) in north and south bank locations which provide shading of the Truckee River. To complete mitigation for the Truckee River losses approximately 3.2 acres will be planted with cottonwoods from the mouth upstream on Steamboat Creek. Also, along North Truckee Drain and Peoples Drain approximately 0.3 acres of riparian will be mitigated for by grading and planting the North Truckee Drain and by planting and maintaining a row of trees (approx. 160 trees) along the South bank of Peoples Drain. An additional 2.6 acres of cottonwood trees will be planted along Steamboat Creek to mitigate for the wetland loss on Boynton Slough. To mitigate for creating an impassable barrier at Wingfield Diversion, new fish ladders will be constructed.

Enhancement Fish and wildlife enhancement measures will improve environmental values beyond what is expected to occur under the no action plan. FWS has recommended in their Coordination Act Report and in their Biological Opinion (see attachment section) the following enhancement measures and the Corps of Engineers agrees to the proposals.

To enhance the Lahontan cutthroat trout recovery, groups of large boulders would be placed in the excavation areas at Booth Street and Arlington Avenue plus other selected locations where the river is wide. Boulder groups would add cover habitat for young and adult fish. FWS would administer this enhancement feature in support of the Endangered Species Act.

In support of the Migratory Bird Conservation Act and the Endangered Species Act, the selected plan includes the purchase and development of 300 acres of marsh and seasonally flooded lands extending upstream about 1 mile from the confluence of Boynton Slough and Steamboat Creek and including both drainages. This area is part of a larger area from Short Lane to the Truckee River required as floodway where flow restricting structures (such as

buildings) would be prohibited. The Federal Government will reimburse or credit 100 percent of the purchase and development costs for marsh enhancement above costs required for flood control. Development would consist of creating several open water ponds totalling about 40 acres, waterfowl nesting islands, about 120 acres of marsh vegetation, and interpretive facilities. This habitat development, in addition to the existing approximately 55 acres, would provide important wetland habitat to migratory birds. This Steamboat Marsh Nature Area would be the only sizable marshland in the Truckee Meadows. The marsh is nesting and wintering habitat to about 20 species of waterfowl (including Canada geese, mallards, and canvasbacks), about 18 species of shorebirds (including killdeer, spotted sandpipers, and long-billed curlews), several wading birds (great blue herons and snowy egrets), a variety of song birds, and some raptors (marsh hawks, Swainson's hawks, and barn owls).

The 4 "sensitive" species (see Section 4.2) occur within this proposed marsh enhancement area. With the proposed development FWS estimates a gain of 445,000 waterfowl use days annually (excluding Canada geese). Ducks hatched would increase by about 2,450 and Canada geese hatched would double to about 120 (FWS, April 1984).

The water quality changes that occur in the wetland can be relied upon to clean up waters polluted by non-point sources in the Boynton Slough and Steamboat Creek drainages. The biological activities of the marsh help to a) add oxygen to the water as a result of photosynthesis; b) assimilate nutrients, metals, hydrocarbon pollutants, and other chemicals; and c) decompose organic materials by microbiota on and in wetland sediments. FWS estimates 14 percent of the Truckee River phosphorus and nitrogen load can be reduced by a developed marsh. This enhancement proposal would also support the Endangered Species Act because pollution of the Truckee River is a significant impediment to reestablishing the cui-ui and Lahontan cutthroat trout.

The cooling of Steamboat Creek water before it enters the Truckee River would benefit the Lahontan cutthroat trout reproduction. The selected plan includes extending by 9.5 acres the cottonwood tree riparian vegetation planting upstream from the mitigation plantings on Steamboat Creek to Pembroke Drive in support of the Endangered Species Act. FWS estimates the Truckee River below Steamboat Creek could be lowered as much as 0.35°F.

6.0 Public Involvement

6.1 Public Involvement Program A public involvement program was begun in 1964, the year the investigation was authorized. A public meeting was held in November 1964 to determine desires of local interests, and studies were initiated in fiscal year 1965. The tentative flood control plan resulting from these studies consisted of storage on the mainstem of the Truckee River at Verdi, storage and interceptor facilities on Steamboat Creek, and channel improvements in Truckee Meadows. However, when presented with the plan, local interests opposed storage at Verdi because of residential and industrial developments in the proposed reservoir area. A later office study concerning Verdi Dam and Reservoir and other alternative reservoir sites did not receive State and local support. Because of continued lack of support, the study was suspended in 1970. In May 1974 Washoe County requested the Corps to consider the economic feasibility of an alternative consisting of lowering the Vista reefs and channelizing the Truckee River. In 1975, a channel enlargement alternative was studied. Results of this preliminary study, which indicated the channel alternative would be feasible, were furnished to the Washoe County Board of Commissioners in 1975. In 1976, Washoe County and the Cities of Reno and Sparks requested that the Corps resume prior studies. In view of this, a public meeting was held in Reno in March 1977 to give agencies and local interests a chance to express their views concerning flood control improvements, recreation, and other environmental needs. Between 1977 and 1979, several public workshops were held as well as coordination meetings with FWS and NDW. In 1979, an Alternatives Environmental Working Paper was circulated to a number of Federal, State and local agencies and other interested persons for review and comment. A public workshop and a public meeting were held in July 1980 in Reno to present possible flood control solutions, including those analyzed in this report. A set of resolutions concerning watershed analysis, greenbelt protection, and local coordination were reviewed by the Corps as a result of these workshops. Since then periodic coordination meetings have been held with concerned agencies, including meetings with local officials in Reno, Sparks, and Washoe County. A public meeting was held on January 12, 1984 to discuss the Draft Feasibility Report and Draft EIS which had been circulated for review in October 1983. Public comments and views will continue to be sought in future planning for the area.

6.2 Required Coordination This EIS is being made available to all concerned agencies and individuals to obtain comments. This EIS includes responses to comments received on the Draft EIS (see Attachment 1). A biological opinion has been obtained from the USFWS Great Basin Complex Office concerning impacts to the listed fish. The National Park Service has been consulted concerning the potential disturbance to recreation features constructed with Land and Water Conservation Act funds and coordination between the agencies continues. Coordination with the Department of Interior, Advisory Council on Historic Preservation, and State Historic Preservation Officer on cultural resources has been initiated and will continue through planning and construction phases. After a project is authorized and more detailed cultural resource studies are completed, a Memorandum of Agreement on impacts and preservation or mitigation actions will be executed with the Advisory Council on Historic Preservation and the State Historic Preservation Office. The impacts to agricultural land have been coordinated with SCS and a rating form was completed in accord with the Farmland Protection Act of 1982. All other required coordination will be undertaken as necessary.

6.3 Statement Recipients Copies of this Final EIS are being sent to the U.S. Departments of Agriculture (Forest Service and Soil Conservation Service); Commerce; Energy; Health and Human Services; Housing and Urban Development; Interior (Fish and Wildlife Service, National Park Service, Bureau of Land Management, and Bureau of Reclamation); Labor; Transportation; and Environmental Protection Agency.

The Final EIS is also being sent to Nevada State agencies: Department of Wildlife, Department of Conservation and Natural Resources, Division of Environmental Protection, Department of Human Resources, Department of Highways, Department of Public Health, Office of the State Forester, Division of the State Parks, State Engineer (Water Resources Division), State Planning Board.

Various county and city (Reno and Sparks) agencies and libraries will receive the Final EIS. Members of the public at large known to be interested will also receive the Final EIS. Organizations having expressed an interest will also receive a copy. These include the Pyramid Lake Tribal Council, Lahontan Audubon Society, The Wildlife Society, the Sierra Club, the Truckee Basin Landowners Protective Association, the Truckee River Federation of Fly Fishermen, and the Sparks Sportsmen.

6.4 Public Views and Concerns Coordination to date has shown strong interest in lessening the existing flood hazard, creating additional recreational opportunities, and enhancing fish and wildlife values. Of course, the flood control plans will, in themselves, create various concerns. The environmental features in the selected plan were developed in response to these environmental needs and concerns raised during coordination of the current and prior studies. Realignment of levees, use of setback levees and floodwalls, a detention basin, elimination of much of the in-channel excavation, and planned mitigation have alleviated many of the concerns associated with riparian vegetation removal and conversion of recreation facilities. Close coordination with FWS and inclusion of their recommendations in the selected plan has resolved the concerns expressed regarding the cui-ui and Lahontan cutthroat trout recovery efforts. Elimination of channelization of Steamboat Creek, design of the detention basin, and acquisition of Steamboat Marsh has resolved concerns over destruction of wetlands. Use of the detention basin to maintain preproject flows below Vista will also satisfy concerns of downstream landowners that they might be impacted by increased flood flows. However, the University of Nevada's concerns for impacts to their Agricultural Experiment Station have not been fully alleviated. Environmental interests and downstream landowners have also expressed a desire for resource improvements on the reach between Vista and Pyramid Lake. Such improvements are not part of the selected plan, since they are not located within the area required for the selected plan features.

References

Arib, Robert. November 1979. The Blue List for 1980. American Birds. National Audubon Society.

Elston, Robert G. and David Turner. 1968. An Archeological Reconnaisance of the Southern Truckee Meadows, Washoe County, Nevada.

Environmental Protection Agency. 15 September 1980. Draft Environmental Impact Statement, Reno-Sparks Joint Water Pollution Control Plant Master Plan, San Francisco, CA.

Hydraulic Engineering Center, U.S. Army Corps of Engineers. July 1982. Watershed Sedimentation Investigation for the Truckee River Basin, Verdi to Vista.

Leeds, Hill and Jewett, Inc. March 1982. Plan for Channel Modifications, Truckee River.

Nevada Department of Wildlife. 1 January 1982 through 31 December 1982. Job Progress Report, Truckee River. Project No. F-20-18. Job No. 107.

Pinzl, Ann. 26 January 1981, Nevada State Museum. Letter to Corps of Engineers.

Regional Administrative Planning Agency. July 1982. Conservation Element Draft Policy Plan.

Reno City Planning Department. April 1982. Reno Policy Plan.

Reno City Planning Department. 1981. Reno City Profile.

Sparks Planning Department. July 1980. Master Plan for Growth Management, City of Sparks, Nevada.

U.S. Air Force. 22 December 1980. MX Environmental Technical Report 17, Protected Species.

U.S. Army, Corps of Engineers, Sacramento District. November 1979. Alternatives Environmental Working Paper - Truckee Meadows.

U.S. Army, Corps of Engineers, Sacramento District. September 1982. Preliminary Biological Assessment.

U.S. Army, Corps of Engineers, Sacramento District. December 1979. Truckee Meadows Investigation (Reno-Sparks Metropolitan Area), Nevada, Stage 2 Report.

U.S. Fish and Wildlife Service. 24 June 1981. Planning aid letter. Sacramento, California Office.

U.S. Fish and Wildlife Service. 1982. Information Required for Cui-ui and Lahontan Cutthroat Trout Habitat Rehabilitation.

U.S. Fish and Wildlife Service. 13 April 1984. Fish and Wildlife Coordination Act Report for Truckee Meadows Investigation (Reno-Sparks Metropolitan Area), Nevada. Great Basin Complex Office.

Personal Communications

Crowe, Leonard. 8 September 1982. Washoe Council of Governments.

Lenaburg, Ray. 8 October 1982. Federal Emergency Management Agency.

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LIST OF PREPARERS

The following people were primarily responsible for preparing this EIS:

NAME	EXPERTISE	EXPERIENCE	ROLE IN PREPARING EIS
Meredith Stephens	Environmental Analyst	8 years environmental consultant for private and public organizations; 4 years EIS studies, Sacramento District Corps of Engineers.	Complete DEIS in draft format.
Robert Martin	Wildlife Biology	9 years EIS studies and 4 years park management, Sacramento District, Corps of Engineers; 1 year wildlife and range studies FWS and BLM.	EIS coordinator affected environment, environmental effects.
Marcia Geidel	Recreation Planning	2 years recreation planning Sacramento District, Corps of Engineers; 2 years private consultant in recreation planning; 6 years recreation specialist, U.S. Army and Air Force.	Recreation plans.
Sannie Kenton	Cultural Resources	6 years, cultural resources management, Sacramento District Corps of Engineers; 11 years cultural management, Federal and private.	Cultural resource review.
Robert Verkade	Landscape Architecture, Envirmental Planning	10 years recreation/environmental planning, Sacramento District Corps of Engineers; 5 years landscape architect/natural resources planner, Vermont Agency of Environmental Conservation.	Report review.
Fred Kindel	Wildlife Management	18 years EIS studies, Sacramento District Corps of Engineers; 7 years wildlife management, State and private.	Report review.
Allan Oto	Civil Engineering	3 years water resources planning studies, Sacramento District Corps of Engineers; 9 years hydraulic and hydrology studies, Hydrologic Engineering Center, Corps of Engineers.	Planning engineer, study manager, formulation of alternatives.

Attachment 1

Letters and Statements Commenting On the Draft EIS and Responses

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PRESENTATION FORMAT FOR COMMENTS AND RESPONSES

The Final EIS addresses comments on the Draft EIS and Draft Feasibility Report. Editorial comments are not included here but have been incorporated into the EIS. Comments of a technical nature specific to the Feasibility Report are not included in the EIS, but have been incorporated as appropriate.

On the following pages appear the comment letters and specific responses. Circled numbers in the margins of the letter refer to the same numbers in the paragraphs of specific responses which follows each letter shown.

U.S. Department of Housing and Urban Development
Reno Service Office, Region IX
1050 Bible Way, Box 4700
Reno, Nevada 89505

January 13, 1984

District Engineer
U.S. Army Engineer District, Sacramento
Corps of Engineers
ATTN: SPKED-W(Inv Sec A)
650 Capital Mall
Sacramento, CA 95814

Dear Sir:

Having read the Truckee Meadows water resource study, and having been in attendance at the public hearing on January 12, 1984, I feel compelled to respond to the recommendations as presented by the Corps of Engineers. My response and subsequent suggestions are impersonal in nature and reflect only the concern I have for the constituancy of the Department of Housing and Urban Development in Reno.

At the present time Reno is reportedly one of the highest "Cost of Housing" areas in the contiguous United States. The principal reasons for this high cost status is (1) lack of suitable developable land and (2) lack of potable water. I would expostulate this problem and the problem of a flood threat in Reno, with a common solution.

By increasing the channel capacity of the river through a combination of dredging, from West of Idlewild Park through the vista gaging area, accompanied by channelization of the Vista reef, the flood threat through the Truckee Meadows with the 117 Million dollar damage potential would be significantly reduced. The resultant reduction of designated flood plain would cause as much as nine hundred acres of prime developable land to be eligible for HUD/FHA insuring.

In those areas designated for parks, a system of double berms could be constructed whereby the area between the riverside berms, and the parkside would be of a pervious material most likely gravel and rock from the dredging operation, covered by sod. The parkside would be of an impervious material, silt, sand and clay, likely removed from the newly formed area. The resultant is that you now have a system whereby the aguifer might be recharged during flood runoff. Incidently, this system is working well in migratory streams and strategically located parks in Salt Lake City, Utah.

I would submit that the subsequent Project Benefit/Cost Ratio would far exceed your projected 4.7 to 1 value.

I would be most willing to meet with you and discuss the merits of this proposal. I can be reached on FTS 470-5356 during working hours.

Sincerely,

C. Raphael Mecham
Manager

RESPONSE TO DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT COMMENTS

Plans without a detention basin but including channel excavation are discussed in the Final Report, Chapter 5, Plan Formulation. The plan with a detention basin was found to be the most economically feasible plan.

United States Department of Agriculture
Soil Conservation Service
P. O. Box 4850
Reno, NV
89505

January 23, 1984

Colonel Arthur E. Williams
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

We have reviewed the Draft Feasibility Report for the Truckee Meadows dated October 1983 and offer the following comments that relate to the Soil Conservation Service mission:

1 The prime land and/or lands of statewide importance acreage figures may need to be further refined prior to completing the final Environmental Impact Statement (Pages EIS-21, 33 & 46).

2 The selected retention basin site (University of Nevada farm) is an agricultural research area. When flooded, it is likely all long and short term research studies would be lost through inundation and/or excessive siltation.

3 It appears that additional levees may be needed to protect sewage plant treatment beds and their waste contents from being flushed down Steamboat and/or Truckee channels.

4 Soils along a good portion of the lower Truckee and Steamboat channels may not be suitable for construction siting or for construction materials, i.e. low strength, cutbank caving, piping, wetness, shrink-swell, etc. Confining additional waters with earthen levees of these materials may further negate their suitability.

5 The University of Nevada residences and other buildings on Kimlick Lane, east of South McCarran, may not have flood protection.

6 Excessive channel scour may occur between irrigation diversion structures in the upper project section of the Truckee. This may not be a problem when the new clear-span bridges are built.

Thank you for the opportunity to review this draft statement.

Sincerely,

GERALD THOLA
State Conservationist

cc: Norman R. Ritter, State Resource Conservationist, SCS, Reno, NV

The Soil Conservation Service is an agency of the Department of Agriculture

RESPONSES TO SOIL CONSERVATION SERVICE COMMENTS

1. The total acres of prime farmland is based on data supplied by SCS and is limited to that within the area potentially impacted by project features. More prime farmland occurs immediately south and east of the Selected Plan features. A rating form has been completed and is being coordinated with SCS to aid in predicting impacts to farmlands.

2. The site will be protected from more frequent events (less than 35-year). With less frequent events, flooding depths will be similar to preproject conditions. Section 5.2, Agriculture, of the Final EIS has been expanded to describe the potential impacts to the experiments.

3. The Selected Plan is not expected to increase the frequency of flooding of the sewage treatment beds. After project authorization, detailed engineering studies will determine whether the Selected Plan needs to include a feature to prevent flooding of treatment beds at a greater than existing frequency.

4. Based on laboratory testing to date the existing foundation in the lower Truckee and Steamboat area is suitable for levee construction. Material for levee construction will be imported. The Selected Section will be designed based on foundation and borrow material and secondary laboratory test results (i.e., shear strength, consolidation, compaction, and permeability tests) to be completed in later design phases of the project.

5. Those buildings will be relocated as part of the project.

6. The river bottom is aggrading in the downtown area. There shouldn't be a problem with scour after project construction.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Colonel Arthur E. Williams
District Engineer
Sacramento District
Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

January 31, 1984

Dear Colonel Williams:

The Environmental Protection Agency (EPA) has reviewed the Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) titled TRUCKEE MEADOWS (RENO-SPARKS METROPOLITAN AREA) NEVADA.

We appreciate that the Draft Feasibility Report and DEIS assessed a range of important issues. We do however, have concerns regarding this project, as discussed in the enclosed comments. We have classified this DEIS as Category ER-2 (environmental reservations - insufficient information).

We appreciate the opportunity to review this document. Please send three copies of the Final Feasibility Report and Final Environmental Impact Statement (FEIS) to this office at the same time it is officially filed with our Washington, D.C. office. If you have any questions, please contact Loretta Kahn Barsamian, Chief, EIS Review Section, at (415) 974-8188 or FTS 454-8188.

Sincerely yours,

Charles W. Murray, Jr.
Assistant Regional Administrator
for Policy, Technical, and
Resources Management

Enclosure (1)

Water Quality Comments

The Final Feasibility Report and FEIS should address the following items:

1. Page 27. Continual reference was made to the 1973 water quality standards in the comparison of existing water quality to water quality standards. The most current water quality standards adopted by the State Environmental Commission (12/79 & 8/80) should be used in the comparison.

2. Page 27. The current water quality standards do have a standard for total nitrogen. Reference should be made to Nevada Administrative Code (NAC) 445.13463 - .13472.

3. Page 37. The impact of the proposed excavation on the water quality of the "ponds" in the Truckee Meadows should be discussed.

4. Page 181, point (c). The Final Feasibility Report and FEIS should explain how excavation will affect channel bed configuration with respect to its cross section. A change in the channel bed configuration from a trough with gradually sloping upgrades (trapezoidal cross section due to natural processes) to an abrupt steep -sided rectangular-shaped trench by excavation, could have significant adverse impacts. Possible consequences may include a shallower flow depth, an increase in temperature due to an increase in surface area, a lower dissolved oxygen capacity, and a change in flow velocity. The effects on aquatic life, especially during summer low flow and from potential temperature changes, should be discussed.

A parabolic cross section (often approximated by a trapezoid) is the optimum shape for the most efficient conveyance of both high and low river flows. Under perfect river conditions, the channel bed will have a tendency to revert back to its natural trapezoidal bed formation, to deepen and enlarge the central portion of the channel. Will continual dredging be required to maintain the proposed steep-sided rectangular-shaped channel bed? What effect will uprooted soils have on bed erosion and flood conveyance efficiency? (See Leopold, L. 1964, Fluvial Processes in Geomorphology, pp. 201-202).

5. Excavation through the downtown will act to change, if not completely then at least locally, the natural slope of the channel bed. The possible establishment of new equilibrium conditions through aggradation/degradation processes should be addressed. How long might this "re-equilibrating" be expected to take? Which areas would be expected to erode/aggrade? Whether such activity would be detrimental to designated beneficial uses (i.e., from increased turbidity or suspended sediments concentrations and the deposition of suspended sediments on spawning areas). (See Water Resources Research, Vol. 19, No. 5, October 1983, pp. 1050-090).

RESPONSES TO U.S. ENVIRONMENTAL PROTECTION AGENCY COMMENTS

1. Priority was given to maintaining as much of the Truckee River channel in its present natural condition as much as possible. Channel excavation was limited to one bank side and the excavated bottom was benched above the normal low water channel near Booth Street Bridge and Glendale Park. Channel excavation around the north and south sides of Wingfield Park Island would lower the channel bottom approximately 1.5 feet. All excavated channel slopes will be protected by revetment. Excavation limited to one bank would minimize the effects on streamside riparian vegetation.

2. The excavation downstream will not significantly change the slope.

6. Pages 187-188. How are the "summer low flow conditions" defined, especially in reference to the Floriston rates? Water quality standards are applicable at flows below the Floriston rates. Do the mitigation/enhancement plans assure that temperature standards will be met at flows below the Floriston rates? 3

7. Page 224. The adverse impacts of changing weather conditions during project construction should be addressed. The Washoe Zephyr typically occurs in this area during late fall/early winter. Wind speeds of up to 50 mph are not uncommon, and gusts of up to 80 mph may occur. Mitigation steps to avoid potential aeolian erosion during the end of the construction season should be presented. 4

8. Page EIS-45. A definition of "rare" should be provided in reference to the chance of a high temperature event occuring. To what degree would water quality standards be violated if drought conditions persist for 2-3 consecutive years, which is not uncommon? Any significant impacts to the endangered cui-ui and threatened Lahontan cutthroat trout as a result of such conditions during the 10-15 year period must be addressed.

A recent article in the Endangered Species Technical Bulletin on cui-ui spawning reveals that the attempts to increase the cui-ui population have been unsuccessful. A sample analysis of prespawning cui-ui have found a majority to be between 7 and 41 years of age, with 93% from the 1969 year class. Given that the cui-ui have been unable to significantly increase in population in the past 15 years, mitigation for a high temperature event must be presented. The range of reproductive capacity of the cui-ui and the effects this event may have on spawning success, given that a majority of the cui-ui are over 15 years old, should be discussed. (See Endangered Species Technical Bulletin, Vol. VIII, No. 10, October issue). 5

9. Pages 187-188, 194, 206, EIS-45, EIS-52, and 37 of USFWS Report. Below is our interpretation of the temperature/mitigation plan; we would appreciate verification or correction on this. In the plan should be included measures to mitigate interim temperature effects (see comment 8, above).

a. Removal of riparian vegetation along the Truckee River could cause a maximum temperature increase of 1.6° F in the Truckee River just below its confluence with Steamboat Creek during the 10-15 year interim period, though this would be a "rare" occurrence? 6

b. Replanting of riparian vegetation will be initiated at the start of construction?

3. The low flow conditions refers only to the average conditions expected. Temperature will be impacted by the removal of riparian vegetation. The mitigation/enhancement plans are not applicable to other factors which affect temperature.

4. These will be addressed in future detailed design studies.

5. The term "rare" has been clarified. It can be stated only generally because water temperature records have been taken for only 25 years and intermittently. A Section 7, Endangered Species Act consultation has been completed and the biological opinion is a no jeopardy condition. Consequently, no mitigation beyond that described on EIS-30 is required.

6. The summary presented in the comment is correct; however, the estimated decreased temperature in the Truckee River from enhancement plantings should be 0.35° F. The Final EIS has been corrected.

c. Mitigation plans call for planting trees (cotton-wood) in places along the Truckee, and along part of Steamboat Creek near its mouth. These trees would completely negate any long term temperature increases in the Truckee due to removal of riparian vegetation (i.e., before "enhancement" plantings, the net temperature increase would be 0° F)?

6

d. Further enhancement plantings along Steamboat Creek will cause a further reduction in temperature, for a potential total net decrease of 0.38° F in the Truckee River just below its confluence with Steamboat Creek?

e. The full effect of the mitigation/enhancement plans will not be apparent for 10-15 years, when the trees mature?

10. There have been numerous issues regarding recent diesel fuel leakages into the Truckee River near downtown Reno. The exact source of the leakage has not yet been determined; however, numerous underground fuel tanks have been located. The Final Feasibility Report and FEIS should address this issue in relationship to the project. Any questions regarding the diesel leakage should be directed to Art Molin, Engineer for the City of Reno, at (702) 785-2230 (note: a study has been submitted documenting the leakage).

7

8

404(b) Comments

1. While the Draft Feasibility Report and DEIS identified alternative plans, these were discarded after the initial screening. Consequently, most of the document addressed the impacts of the selected plan or the no action alternative. There was no real in depth discussion of the impacts of the alternative plans. Under §1502.14 of the CEQ regulations at 40 CFR 1500-1508, alternatives must be considered in detail so that reviewers may evaluate their comparative merits.

8

2. The purchase and development of 300 acres of marsh and seasonally flooded lands near the confluence of Boynton Slough and Steamboat Creek was identified as part of the mitigation and enhancement program of the selected plan. A detailed discussion of how this acquisition will be made should be included in the Final Feasibility Report and FEIS.

9

7. Hydrocarbon pollution of the Reno/Sparks groundwater table has been identified and well documented. Due to the flow characteristics of this aquifer and the minor amount of excavation required, the Selected Plan is not expected to have an effect on the rate of pollution.

8. The other alternatives considered are discussed in Chapter V in the main report. Impacts were considered for these alternatives in the Alternatives Environmental Working Paper which was coordinated with other agencies. They were not discussed in detail in the EIS because none were found to be feasible.

9. Section 5.3 of the Final EIS and Chapter VI of the main report have been revised to state that purchase of enhancement areas would be 100% Federal cost beyond the required land acquisition only for flood control purposes. Mitigation lands are acquired on the same cost sharing basis as lands for flood control. The local sponsor is required to purchase all lands, easements, and rights-of-way for the project. Additional detail on acquisition is developed after project authorization.

United States Department of the Interior
BUREAU OF RECLAMATION
MID-PACIFIC REGIONAL OFFICE
2800 COTTAGE WAY
SACRAMENTO, CALIFORNIA 95825

IN REPLY
REFER TO: MP-150

FEB 6 1984

Arthur E. Williams
Colonel, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

We have reviewed the Corps' Truckee Meadows Draft Feasibility Report (DFR) and Draft Environmental Statement (DES) and have the following comments and questions:

1. DFR, page 30. The sentence beginning on line 1 might be reworded: "Automobile emissions are a major factor in the pollutant load of the basin."

2. DFR, page 81. The second paragraph states the need to satisfy a demand for rafting/tubing and jogging. There is no reference to these activities in Table 6, page 52.

1 3. DFR, page 83. The first sentence identifies the need to "protect open space from urban encroachment and competing land uses." In light of this, an economic comparison of local non-Federal actions with the project proposal would appear to be necessary.

2 4. DFR, page 98. The relationship between the statement in the second full paragraph on page 98 and the statement on the first three lines of page 37 appear inconsistent when the entire river is discussed.

3 5. DFR, page 165. Since it is not within the Corps' authority to provide flows for fishery enhancement the statement in paragraph H. 1. needs clarification. Flows will have to be determined by settlement of water rights conflicts, in which fishery concerns are addressed.

6. DFR, page 168. Delete reference to Bureau of Reclamation in the first sentence. The Bureau of Reclamation is not currently authorized to install fish screens. Further, our restoration plans have changed with the emphasis being placed on the rehabilitation of the lower river.

4 7. DFR, pages 171 and 189. With a channel bottom width of 200-260 feet, how will the trees provide sufficient shade for temperature control? Such control may not be effective unless a shaded channel for normal flows is provided,

7

RESPONSES TO U.S. BUREAU OF RECLAMATION, MID PACIFIC REGION, COMMENTS

1. The statement is simply a summary of similar statements in local plans. Both the No Action Plan and the Selected Plan are described in the EIS.

2. The discussion on page 98 refers to sediment in the project area while the discussion on page 37 refers to the area at the mouth of the Truckee River.

3. The potential for additional flows was addressed during feasibility studies. The Selected Plan does not include this feature.

4. The excavation described on page 171 refers to the channel-levee plan; the plantings on page 189 refer to the Selected Plan. The excavation is considerably less in the Selected Plan and will not adversely affect long-term shading.

5 8. DFR, Table 31, page 232. It would be beneficial to have additional data supporting the recreation benefits estimated.

6 9. DES, page 6. No. 18 states that the Selected Plan is in full compliance with E.O. 11990. This statement would derive support from mitigation and enhancement plans which would ensure cover and food supply which is not ordinarily realized from native trees planted on 25-foot centers (p. 187, last paragraph; p. 192, last paragraph).

10. *Draft Fish and Wildlife Service Coordination Act Report*, page 37. Reference 19 cannot be used to derive the 1.5° F/mi reduction in lower Steamboat Creek. It is unclear as to how this figure was derived. The third paragraph needs further clarification.

7 In general, it is difficult to determine the project effects because the criteria for suitable fish habitat are not identified. Specific water quality changes should be compared with known life cycle requirements of the affected fish species, since different periods in the life cycle of a given species can have different criteria for success.

8 Further, an analysis is needed on how effective mitigation measures (i.e., flood detention basin in providing flood control, riparian plantings on water temperature) are, and what the net impacts of the proposed alternative will be.

Thank you for the opportunity to comment on this document.

Sincerely yours,

NEIL W. SCHILD
ACTING REGIONAL DIRECTOR

5. The estimated uses by recreation activity are shown in Table 29. The values per user day were estimated using a travel cost analysis for general recreation, rafting, and bicycling in accordance with principles and guidelines. This is described in Chapter 6.

6. Much of the riparian vegetation to be mitigated does not come under EO 11990 wetlands definition. Since the planting is mitigation, we are replacing the existing habitat which is similarly spaced.

7. The EIS summarizes the results of an impact analysis by FWS and the Corps which did consider life cycle requirements in the context of with and without Selected Plan habitat conditions. See FWS report, Attachment 3, for details of this analysis.

8. The detention basin is expected to reduce peak flows downstream to the without project levels. The EIS explains the expected results of fish and wildlife mitigation measures which are the return of water temperatures and wildlife habitat to preproject conditions, fully replacing the amount of habitat removed.

United States Department of the Interior
BUREAU OF RECLAMATION

LAHONTAN BASIN PROJECTS OFFICE
P. O. BOX 640
CARSON CITY, NEVADA 89702

IN REPLY
REFER TO:

DEC 12 1983

Colonel Arthur E. Williams
District Engineer
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Colonel Williams:

Re: SPKED-W

We have reviewed your Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement. As presented, the proposed plan will preserve or enhance fish and wildlife values in the Truckee Meadows area and maintain instream flows for downstream uses. Therefore, your proposal appears acceptable, and we have no modifications to recommend.

However, we do wish to call your attention to the following items which may require clarification:

1) Page 38, paragraph 3 - Historically, cui-ui did not spawn in the Truckee River "well up into California." An accurate statement *relative to cui-ui historic range is found on page EIS-32.*

2) Page 85, paragraph 1 and page 167, paragraph 1 - The Office of Endangered Species is located only in Washington, D.C. It is more likely that your staff has been in contact with the endangered species staff from Fish and Wildlife Service's Reno office.

3) Figure 6, page 136, and Plate 1 - Nevada route numbers have been *revised; e.g., State Route (S.R.) 27 (Mount Rose Highway) is now* 431, S.R. 29 is now S.R. 28, and S.R. 34 is now S.R. 447.

1 4) Page 183 - Your recreation plan includes access sites to facilitate and promote rafting/tubing and swimming; however, according to the Reno City Attorney, these activities are currently prohibited within the city limits.

Thank you for the opportunity to comment.

Sincerely

for Harvey R. Nelson, Jr.
Projects Manager

RESPONSE TO DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, LAHONTAN BASIN PROJECTS OFFICE COMMENTS

1. According to the City of Reno Planning Department, Reno has no ordinance prohibiting tubing and rafting on the Truckee River, but the Reno municipal code, Section 8.22.100 does prohibit bathing and swimming in the Truckee River within the Reno City limits. We were advised that the Section 8.22.100 code should not prevent the Corps from recommending recreation sites for these types of activities since ordinances can change.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
GREAT BASIN COMPLEX OFFICE
4600 Kietzke Lane - Bldg. C
Reno, Nevada 89502-5093

January 30, 1984

District Engineer
Department of the Army
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

10

This is in response to the Truckee Meadows Draft Feasibility Report and Draft Environmental Statement. We have reviewed the documents and have the following comments.

Comments regarding the draft feasibility report:

1) On page 83 it is stated that the Truckee River "cannot support sustained populations of coldwater fish." The Truckee River does support populations of trout and mountain whitefish as stated in the Fish and Wildlife Coordination Act report (Pgs. 8 and 9). Even under drought conditions, such as 1977, the river supported marginal populations of these species within the lower portions of the project area. In 1977 the transition zone between warmwater and coldwater species moved from below the confluence of Steamboat Creek with the Truckee River to the Kietzke Lane bridge. It should be recognized that even during this extreme situation limited populations of brown and rainbow trout were found in the river below Vista.

2) On page 38 it is stated that cui-ui had naturally spawned in California. The cui-ui has not been observed to spawn upstream of the McCarran ranch which is located between Derby Dam and Vista.

3) Upon checking conflicting data on total phosporous levels during high water between the Fish and Wildlife Coordination Act report (>4 lbs./hr) and the draft feasibility report (2 lbs/hr) it was discovered that both figures are in error. The correct value is 20 lbs/hr.

4) We suggest clarification of the last sentence on page 102. The potential fishing use was based on NDOW catch per unit effort per angler-day, population trend data, and various assumptions by the FWS. The FWS estimated the fishing use to be 101,189 angler days during the 50 year period. On page 103 the second sentence states fishing use to

be from 61,000 to 65,000 angler days without the project. This does not follow the FWS data presented in the attached draft Coordination Act Report.

5) On page 210 the last two sentences in the first paragraph should be changed to correctly read: "This impact would be a rare event and would occur only during the 10 to 15 years required for the shade canopy to become fully reestablished. The project with enhancement features could result in lower water temperatures and better water quality than is expected to occur without the project once the vegetation is reestablished."

Comments regarding the draft environmental statement:

1) On page 20, under impact to fish for the no action alternative, it is stated that there will be "continued temperature problems for spawning coldwater fish." This is true only below Steamboat Creek during normal years and below the Kietzke Lane bridge during drought years. Also in these critical areas temperature is a problem to coldwater fish not only during the spawning season but at other times as well. Without the project the temperature problem will be no worse than it is at present. The effect of increased flows from Stampede reservoir has already improved the temperatures in the river. 1

Additional comments concerning the threatened Lahontan cutthroat trout and the endangered cui-ui will be addressed in our Biological Opinion portion of the Section 7 Formal Consultation by March 29, 1984.

Sincerely,

Donald J. King
Complex Manager

11

RESPONSE TO U.S. FISH AND WILDLIFE SERVICE COMMENTS

1. Table 3, Comparative Impacts of Alternatives was revised to reflect this information.

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CARSON CITY DISTRICT OFFICE
1050 E. William St., Suite 335
Carson City, Nevada 89701

IN REPLY REFER TO:

1790
(NV-035)

Col. Arthur E. Williams, District Engineer
Department of the Army
Corps of Engineers, Sacramento District
650 Capitol Mall
Sacramento, California 95814

JAN 4 1984

Attention: SPKED-W

Dear Colonel Williams:

The Truckee Meadows Draft Feasiblity Report and Draft Environmental Impact Statement does not include maps with scales large enough for us to determine whether any of the proposals or alternatives would entail development on public lands administered by the Bureau of Land Management near Huffaker Hills, Whites Creek, or Thomas Creek. I enclose copies of larger scale maps which show the locations of those federally owned parcels. The Corps of Engineers would have to further coordinate with my office to obtain authorization for any developments on those lands.

Sincerely yours,

Thomas J. Owen
District Manager

Enclosures:
Maps

12

RESPONSE TO COMMENTS FROM DEPARTMENT OF INTERIOR, BUREAU OF LAND MANAGEMENT COMMENTS

At the present time, the Selected Plan does not include development on public lands administered by the Bureau of Land Management. If the project changes in the future and does impact on Bureau of Land Management lands, there would be close coordination with the Bureau to obtain authorization to develop these lands.

UNITED STATES
DEPARTMENT OF THE INTERIOR
OFFICE OF THE SECRETARY
PACIFIC SOUTHWEST REGION
BOX 36098 • 450 GOLDEN GATE AVENUE
SAN FRANCISCO, CALIFORNIA 94102
(415) 556.8200

ER 84/179

MAR 12 1984

Colonel Arthur E. Williams
District Engineer, Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Dear Colonel Williams:

As requested by your letter of February 2, 1984, the Department of the Interior (DOI) has reviewed the Draft Truckee Meadows Feasibility Report and Draft Environmental Impact Statement (DEIS), Washoe County, Nevada. An evaluation of probable fish and wildlife impacts resulting from the proposed project was presented in a May 24, 1983, draft Fish and Wildlife Coordination Act (FWCA) Report (Appendix of DEIS). The final FWCA Report will be developed by March 12.

General Comments

We believe that the subject document is basically well written. As indicated in your letter, you previously distributed copies of the subject report directly to a number of DOI bureau offices for review. In addition to the January 30, 1984, technical assistance comments developed by the Fish and Wildlife Service, we are providing the following comments that cover concerns of the National Park Service and Bureau of Mines.

Specific Comments

Cultural Resources

On page EIS-46 the statement appears: "According to a representative of the Nevada Historical Society, the Lake, Center, and Sierra Bridges are not considered to be historically significant." This statement is inconclusive with regard to the legal issue of determining the eligibility of all historic resources. Generally, downtown Reno, due to extensive redevelopment, has relatively few older structures of high integrity that have survived. Consequently, structures in other cities that might not be eligible within the context of extant historic resources, may well be eligible

1

13

RESPONSES TO U.S. DEPARTMENT OF THE INTERIOR, PACIFIC SOUTHWEST REGION COMMENTS

1. The referenced statement has been revised based on a meeting with the State Historic Preservation Office. See Response 1 for the Advisory Council on Historic Preservation.

for their local significance within the context of Reno's more limited inventory of historic resources. Moreover, the river forms one of the major and most focal physical amenities in the city. Therefore, the potential for the eligibility of these bridges, particularly those 50 years
1 in age and older, seems great. The eligibility of the existing treatment at the river banks, including retaining walls, light standards, and any other amenities should also be considered, perhaps within the context of the eligible bridges. We strongly recommend that the State Historic Preservation Officer be consulted regarding the eligibility of these structures and that appropriate alternative measures be formulated in the interest of preserving historic resources.

Recreational Resources

The proposed project has the potential to impact a number of recreation sites that have been funded through the Land and Water Conservation Fund
2 (L&WCF). By letter of September 28, 1983, to the District Engineer, Sacramento, the National Park Service provided comments on these potential impacts. A copy of that letter is enclosed and the comments contained would appear to also apply to the current report/statement. Also, the environmental statement should both reference this letter and document coordination with the Nevada Division of State Parks, the representative for the L&WCF in Nevada.

Mineral Resources

The Bureau of Mines' Mineral Industry Location System (MILS) indicates there are four mineral properties within or near the project boundary. They are:

1. Lahontan Clay - T. 19 N., R. 20 E., sec. 21; a deposit of alumina clay.

2. Isabell - T. 19 N., R. 20 E., sec. 7; a formerly producing sand and gravel deposit.

3
3. Second Street Pit & Plant - T. 19 N., R. 20 E., sec. 7; a producing sand and gravel operation.

4. Short Ranch Pit - T. 19 N., R. 20 E., sec. 7; a producing stone quarry.

In view of the fact that minerals are natural resources and their development or use might possibly be affected by the proposed project, the Corps of Engineers should field check for these deposits and for possible projections of similar deposits into the project area.

Although impacts on the mineral natural resource may be unlikely, any effects (either beneficial or adverse) to mineral deposit development or utilization must be considered and evaluated in the final EIS.

14

2. Existing recreation areas funded by the Land and Water Conservation Fund Act (LWCFA) that would be impacted have been described more accurately in the EIS and Chapter VI, paragraph B., 2.b. of the main report. Further coordination was undertaken with the National Park Service and the Nevada Division of State Parks in an effort to more accurately identify lands and facilities in the Sparks Greenbelt that were developed with LWCFA funds. LWCFA lands would be converted to flood control features and the Selected Plan includes replacement lands to be located at the proposed Franklin Park.

3. Only resources that could be potentially impacted, whether beneficially or adversely were discussed. Impacts to mineral resources were found to be minimal or insignificant. Sites proposed for project features were judged to have no effect on mineral deposit development or its utilization.

Summary Comments

We appreciate the many measures that have been taken to minimize adverse environmental efforts related to this project. We basically support the project, as proposed, and encourage the continued coordination between the Corps and DOI bureau offices.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

Enclosure

cc: Director, DOI (w/incoming copy)
Reg. Dir., FWS
Reg. Dir., NPS
Reg. Dir., BM

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

Reply to:

730 Simms Street, Room 450
Golden, Colorado 80401

December 13, 1983

Colonel Arthur E. Williams
Department of the Army
Sacramento District
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

The Council received a review copy of the "Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement" on November 22, 1983. We are concerned with the scant consideration given thus far to historic resources.

The documents in question barely mention historic resources. There is no mention of any inventory of historic properties. The documents do mention the presence of one National Register listed property and site that a Memorandum of Agreement will be developed to cover the treatment of that property. There is no discussion of other properties or of how the Corps proposes to deal with them.

1 We also note that the documents claim to be in "full" compliance with the National Historic Preservation Act (16 USC 470). Section 106 of the Act requires that the Council be given an opportunity to comment on Federal undertaking's that may effect historic properties. Section 106 is implemented by the Council's regulations 36 CFR Part 800. Until the Corps has requested the Council's comments pursuant to Section 106 in accordance with Part 800, it can not be in full compliance with the requirements of the National Historic Preservation Act.

Finally, we note that the available documentation indicates that the proposed undertaking will effect at least one National Register Property and that there is a likelihood that other National Register eligible properties may be affected. Therefore, we urge you to initiate consultation with the Council as soon as possible to insure that historic properties are fully considered in the planning of this undertaking.

RESPONSE TO ADVISORY COUNCIL ON HISTORIC PRESERVATION COMMENTS

1. Sections of the EIS dealing with cultural resources have been revised to provide additional information on impacts to known historic resources. The National Register status of the Virginia Street bridge has been identified. Full compliance as used in this EIS refers to full compliance for this stage of planning. Coordination with both the Advisory Council and the State Historic Preservation Officer has been initiated and will continue through future planning stages. An intensive survey and evaluation for the National Register will be conducted in advanced engineering studies.

If you have any questions or if we may provide you with further assistance, please contact Alan Downer at (303) 234-4946, an FTS number.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

STATE CLEARINGHOUSE PROGRAM
FEDERAL IMPACT
REVIEW PROGRAM

OFFICE OF COMMUNITY SERVICES
1100 EAST WILLIAM, SUITE 109
CARSON CITY, NEVADA 89710
(702) 885-4420

TO:

- __ Governor's Office
- __ Attorney General
- __ Administration
- X Agriculture
- __ Commerce
- __ Community Services
- __ State Job Training Office
- __ Economic Development
- __ Education
- __ Employment Security Department
- __ Dept. of Minerals
- __ Equal Rights Commission
- __ Human Resources
- __ Indian Commission
- __ Labor Commission
- __ Legislative Counsel Bureau
- __ Library
- __ Prisons
- __ Public Service Commission
- __ Taxation
- __ Transportation
- __ UNR-Bureau of Mines
- __ UNR-Dept. of Range, Wildlife, and Forestry
- XX Wildlife
- __ Press Room-Capitol Building
- __ _____
- __ _____
- X Conservation and Natural Resources
- X State Lands
- __ Conservation Districts
- X Environmental Protection
- __ Forestry
- __ Hist. Preservation & Archeology
- XX State Parks
- X Water Planning
- X Water Resources

FROM: Linda A. Ryan, Director

SAI NV # 84300049 PROJECT: DEIS/Truckee Meadows (River) Flood Control Project - U.S. Army Corps of Engineers

Attached for review and comment is a copy of the aforementioned project. *Please evaluate it with respect to:*

1) the program's effect on your plans and programs;
2) the importance of its contribution to State and/or areawide goals and objectives;
3) its accord with any applicable law, order or regulation with which you are familiar and/or
4) additional considerations.

PLEASE SUBMIT YOUR COMMENTS NO LATER THAN 1/23/84. Write out your comments if applicable, check the appropriate box below and return the form to this office. PLEASE DO SO EVEN IF YOU HAVE NO COMMENT on this particular project so that we may complete our processing. If you are unable to comment by the prescribed date, please notify this office immediately.

THIS SECTION TO BE COMPLETED BY REVIEWING AGENCY:

- __ No comment on this project
- __ Proposal supported as written
- __ Additional information (see below)
- __ Conference desired (see below)
- __ Conditional support (outlined below)
- __ Disapproval/denial of funding (must specify reason below)

Comments: (use additional sheets if necessary)

AIR-Dick Serdoz: The Draft Report or EIS did not specifically identify any impact on the approved State Air Quality Implementation Plan (SIP). The traffic problem in the Reno core area may be significantly altered or modified with the implementation of the proposed project. Increase usage was alleged, however there was no discussion on how access would be achieved. The project appears to disturb over twenty (20) acres of land therefore, a land disturbance permit will be required from A.Q. Section of DEP. The EIS did not specifically indicate it would comply with executive order 12088, but other orders were addressed. 1

WATER-Dick Thomas: See attached letter.

SOLID WASTE-Verne Rosse: No comment.

L. H. Hedgion/kgw — Reviewer's Signature
Administrator — Title
885-4670 — Phone
1/20/84 — Date

RESPONSE TO NEVADA STATE CLEARINGHOUSE FEDERAL IMPACT REVIEW PROGRAM — AIR COMMENTS

1. Until detailed designs are completed after project authorization, it is only possible to make general estimates as to construction impacts to air quality. Impacts are expected to be very small from construction equipment. In the downtown Reno area the without project condition impacts would be nearly the same as the Selected Plan because of the redevelopment plans which would produce a similar amount of air pollution from construction equipment. The details of traffic flows during construction would be determined during the detailed design stages. However, traffic congestion during bridge replacements would cause added emmissions. After project construction the traffic flow pattern would return to existing conditions. Very little non-local traffic is expected to result from the recreational fish and wildlife enhancement features. Executive Order 12088 has been added to the Final EIS.

NEVADA DIVISION OF WATER PLANNING

STATE OF NEVADA
ADDRESS REPLY TO:
DIVISION OF WATER PLANNING
201 S. FALL STREET, NYE BLDG.
CAPITOL COMPLEX
CARSON CITY, NEVADA 89710

TELEPHONE (702) 885-4380

January 23, 1984

TO: Office of Community Services - Federal Impact Review Program
FROM: Robert E. Walstrom, Hydraulic Engineer III Bob Walstrom
SUBJECT: SAI NV # DEIS/Truckee Meadows (River) Flood Control Project - U.S. Army Corps of Engineers

The Division has completed its review of this proposal and have no comment at this time concerning water resources or water planning.

cc: State Lands

[This project review due 1/23/84]

RESPONSE TO DIVISION OF WATER PLANNING COMMENTS

No additional response needed.

STATE OF NEVADA

RICHARD H. BRYAN
Governor

LINDA A. RYAN
Director

STATE OFFICE OF COMMUNITY SERVICES

Capitol Complex
Carson City, Nevada 89710
(702) 885-4420

February 2, 1984

20

George C. Weddell, Chief
Engineering Division
U.S. Corps of Engineers
Sacramento District
650 Capitol Mall
Sacramento, California 95814

Re: SAI NV No. 84300049 Project: DEIS Truckee Meadows
Flood Control Project
SPKED-W

Dear Mr. Weddell:

Attached is an additional comment from the Nevada Division of State Parks that was received after our previous letter to you. Please incorporate this comment in your decision making process.

Sincerely,

John B Walker

John B. Walker, Coordinator
Clearinghouse Program

JBW/aa

Enclosure

STATE CLEARINGHOUSE OGRAM
FEDERAL IMPACT
REVIEW PROGRAM

OFFICE OF COMMUNITY SERVICES
1100 EAST WILLIAM, SUITE 109
CARSON CITY, NEVADA 89710
(702) 885-4420

TO:

__ Governor's Office	__ Labor Commission	
__ Attorney General	__ Legislative Counsel Bureau	X Conservation and Natural Resources
__ Administration	__ Library	
X Agriculture	__ Prisons	X State Lands
__ Commerce	__ Public Service Commission	__ Conservation Districts
__ Community Services	__ Taxation	X Environmental Protection
__ State Job Training Office	__ Transportation	__ Forestry
__ Economic Development	__ UNR-Bureau of Mines	__ Hist. Preservation
__ Education	__ UNR-Dept. of Range, Wildlife,	& Archeology
__ Employment Security Department	and Forestry	XX State Parks
__ Dept. of Minerals	XX Wildlife	X Water Planning
__ Equal Rights Commission	__ Press Room-Capitol Building	X Water Resources
__ Human Resources	__ _____	
__ Indian Commission	__ _____	

FROM: Linda A. Ryan, Director

SAI NV # 84300049 PROJECT: DEIS/Truckee Meadows (River) Flood Control Project - U.S. Army Corps of Engineers

Attached for review and comment is a copy of the aforementioned project. Please evaluate it with respect to:

1) the program's effect on your plans and programs;
2) the importance of its contribution to State and/or areawide goals and objectives;
3) its accord with any applicable law, order or regulation with which you are familiar and/or
4) additional considerations.

PLEASE SUBMIT YOUR COMMENTS NO LATER THAN 1/23/84. Write out your comments if applicable, check the appropriate box below and return the form to this office. PLEASE DO SO EVEN IF YOU HAVE NO COMMENT on this particular project so that we may complete our processing. If you are unable to comment by the prescribed date, please notify this office immediately.

THIS SECTION TO BE COMPLETED BY REVIEWING AGENCY:

__ No comment on this project	__ Conference desired (see below)
__ Proposal supported as written	__ Conditional support (outlined below)
__ Additional information (see below)	__ Disapproval/denial of funding (must specify reason below)

Comments: (use additional sheets if necessary)

Please see attachment.

John Richardson, Administrator
Nevada Division of State Parks

Reviewer's Signature | P+R Planner (Title) | 885-4370 (Phone) | 1-30-84 (Date)

COMMENTS ON DRAFT FEASIBILITY REPORT
AND DRAFT EIS
TRUCKEE MEADOWS BY CORPS

1. The study of the problems of the Truckee Meadows by the CORPS has been going on at least since the mid-1960's. The latest thing I can find in our files is an August 1980 report of my attendance of a CORPS meeting in Reno.

1 2. The draft feasibility report still does not adequately address the watershedwide problem of how to prevent flooding in the Truckee Meadows. It does not look upstream where the water's coming from, down stream where blockages occur, or north and south for tributaries and excessive sheet flow problems outside the urban area itself. It appears these may have been dropped from consideration because of probable construction costs associated with an expanded control project. The plan says, "Given the current policies regarding Corps participation, any flood control plan for the tributaries would be local responsibility" (p. 176).

2 3. Cost of this project in the urban area only, is estimated (in 1982 dollars) as being $67.3 million; $33.7 million would not be federally funded (p. 234). The potential local sources of non-federal funds is not adequately addressed.

3 4. The EIS (p. EIS-5) does disclose a question regarding L&WCF. It states, "It is not know whether L&WCFA funds will be used or credited for non-federal cost sharing." It is our own current undertanding of the program that the funds could not be used in this manner. However, if the CORPS can get L&WCF to match federal funds for recreation on this project, we recommend that it be a special allocation by Congress or the National Park Service. The state's normal apportionment is too small for it to be used for a proposed project of this magnitude. The EIS does disclose this as a problem (EIS-5).

5. Figure 11 indicates more disturbance of recreational facilities than is described on p. 182. Discussion is not adequate to give a clear understanding of exactly what is to be done to existing recreational facilities. "In developed facility areas, mitigation will provide for equivalent replacement of facilities." We are please to see this statement, but a) does this apply only in existing parks; what about bike/jogging/walking paths along the river, but outside parks per se? b) if a levee or flood wall is built, where will the replacement facilities, including river-edge paths be situated; will they still have the same ambiance?

4 6. A third pedestrian/bike bridge would be beneficial if constructed at river access site 10 to tie the proposed south side of the river bike path to the one on the north side.

5 7. Does "site No. 3" on Table 20 extend east far enough on the south side of the river to connect with the paths at Brodhead Park?

RESPONSES TO NEVADA STATE CLEARINGHOUSE
FEDERAL IMPACT REVIEW PROGRAM
NEVADA DIVISION OF STATE PARKS
COMMENTS

1. The study process included evaluation of upstream reservoirs and bypass channels and evaluation of channel work downstream of the project area to remove the obstructions. Tributaries north and south of the Truckee River in the study area were evaluated but did not meet the federal criteria to include them in the project. See the Feasibility Report, Chapter 5, Plan Formulation, for more detail.

2. A discussion of local financing can be found in the Feasibility Report, Chapter 7.

3. The referenced sentence has been removed from the Final EIS. No other Federal funds may be used to match Federal expenditures for recreation.

4. This proposal will be considered during a later planning stage should the local sponsor desire it.

5. The proposed pedestrian/bike path will connect with the path at Brodhead Park.

8. Figure 11 shows a levee proposed along the north side of the river east of McCarran Blvd., yet Plate 14 does not show the existing park near Tarner Drive and the bike path east to Vista, as being disturbed by construction.

6

9. Many of the existing recreational sites along the Truckee were either purchased with L&WCF money or were donated and used as the local match for L&WCF money. On p. 225 it states "Easement of fee title would be required for all flood control improvements. A permanent easement or fee title, would be necessary for levee or floodwall construction plus a permanent access easement 15 feet wide located adjacent to the landward side of the construction easement." As long as title remains with a public entity there is no problem with land ownership. However, the use of the land must be maintained as having equal or better recreational benefits and must remain in recreational use. If any of the L&WCF land's use is proposed to be changed to levees and flood wall construction then a) approval must be obtained from the National Park Service through the Nevada Division of State Parks and b) like land of at least equal value and better than equal recreational benefits must be substituted. Since the draft is not specific enough to detail where recreational impacts would occur, we are unable to comment further. However, on EIS-46 it does become a little more specific at one site, "there would be a long-term loss of about 5.6 acres of high elevation ground at Glendale Park due to excavation of the waterside section". The draft does not state where this 5.6 acres is, but much of the park was a L&WCF grant. We are concerned that this may be happening elsewhere also.

7

CSS:em

6. Plate 14 was meant to show only those parks disturbed. The levee will not disturb the bike path except at the locations shown.

7. See response to Department of Interior, Pacific Southwest Region on LWCFA lands.

STATE OF NEVADA

RICHARD H. BRYAN
Governor

LINDA A. RYAN
Director

STATE OFFICE OF COMMUNITY SERVICES

Capitol Complex
Carson City, Nevada 89710
(702) 885-4420

January 27, 1984

George C. Weddell, Chief
Engineering Division
U.S. Army Corps of Engineers
Sacramento District
650 Capitol Mall
Sacramento, California 95814

Re: SAI NV #84300049 Project: DEIS Truckee Meadows Flood Control Project, SPKED-W

Dear Mr. Weddell:

Attached are the comments from the Nevada State Department of Wildlife and the Nevada Divisions of Environmental Protection and Water Planning concerning the above referenced project. We will forward any additional comments received regarding this proposal.

These comments constitute the State Clearinghouse review of this proposal at present. Please address these comments or concerns in the final decision.

Sincerely,

John B Walker

John B. Walker, Coordinator
Clearinghouse Program

JBW/aa
cc: Pam Wilcox, State Lands
Enclosure

24

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
1100 Valley Road
P.O. Box 10678
Reno, Nevada 89520-0022
(702) 789-0500

RICHARD H. BRYAN
Governor

WILLIAM A. MOLINI
Director

January 16, 1984

Ms. Linda Ryan, Director
Office of Community Services
1100 East William, Suite 109
Carson City, NV 89710

Dear Linda:

We appreciate the opportunity to review and provide comments on the Truckee Meadows Flood Control Project DEIS which was prepared by the U.S. Army Corps of Engineers (SAI NV #84300049). Our agency has a valid interest in proposed changes to the Truckee River drainage because of the importance of this watercourse to the fish and wildlife resources in the area. Although we certainly recognize the need for flood control measures throughout the urban areas of the Truckee Meadows, we also believe that the fish and wildlife values are worth preserving.

This document appears to provide sufficient alternatives and assessments of the potential impacts of the project on the fish and wildlife resources. The needs of fishlife throughout the impact area are also adequately addressed. The proposals listed in the document which we feel are especially beneficial include the following:

1. The creation of seven new access sites to the river for consumptive and nonconsumptive recreational use.

2. The planting of riparian vegetation along the lower Steamboat Creek and associated marsh enhancement which will act as a buffer for runoff.

3. Placement of boulders along Booth and Arlington streets as a means of enhancing the stream bottom.

4. Use of hydraulic dredging, silt curtains, flow diversions, and timing of construction during low flows in an effort to minimize turbidity associated with construction.

5. The installation of fish ladders at the Wingfield diversion.

25

0-332

RESPONSE TO NEVADA DEPARTMENT OF WILDLIFE COMMENTS

Suggested changes have been made.

6. The placement of levees back from the river's edge with follow-up planting of riparian vegetation.

7. The installation of fish screens along some of the more important diversion ditches.

We did note a couple of errors in the manuscript which the Corps may want to consider correcting prior to issuance of the final EIS. The suggested changes include the following:

1. It is stated on page 35 that the average annual fish planting for the Truckee River in Nevada is 211,300 pounds. We realistically attempt to stock about 25,000 pounds annually or 100,000 to 125,000 total fish (four to five fish per pound.)

2. The value class stream rating system for Dry and Jones creeks as listed on page 33 appear to be unrealistic. Since these streams are intermittent, we would suggest a rating of IV (limited fishery resource).

Recognizing the need to instigate flood control measures and further recognizing that alterations may not always be in the total best interest of the fish and wildlife resources, we believe that the Corps has done an excellent job of addressing the concerns of all interested parties. We look forward to working with the Corps and other agencies in the near future as the project progresses.

If you have any questions on these comments or feel a need for further input at this time, please advise.

Sincerely,

WILLIAM A. MOLINI, DIRECTOR

William G. Parsons

William G. Parsons
Acting Director

RPM:pw

cc: USFWS - Reno
Region I

STATE OF NEVADA
DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL PROTECTION
Capitol Complex
CARSON CITY, NEVADA 89710
Telephone (702) 885-4670

January 5, 1984

Col. Arthur E. Williams
Department of the Army
Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

RE: SPKED-W, Nov. 4, 1983

Dear Colonel Williams:

In several instances Truckee Ditch has been referred to as the Truckee Drain. North Truckee Drain originates at the east side of Glendale Bridge in Sparks and travels in a northeasterly direction for approximately 3.9 miles to join North Truckee Ditch at Parlanti Lane and Howard Drive. Most of the 3.9 miles is a covered aquaduct.

A. Corrections:

1. p 181 item e - "The North Truckee Drain" - change to the North Truckee Ditch

   p 192 line 5 - "The North Truckee Drain" - change to the North Truckee Ditch

   EIS-2 item (4) - ("North Truckee Drain") - change to the North Truckee Ditch

   EIS - 17, item 5 - "The North Truckee Drain" - change to the North Truckee Ditch

   EIS - 44, line 6 - "The North Truckee Drain" - change to the North Truckee Ditch

   Fish & Wildlife Coordination Act Report page 4, item 5 - "The North Truckee Drian diversion dam - change to the North Truckee Ditch diversion dam.

2. A gross error was noted on page 194, "Turbidity levels downstream of construction sites will meet the State Water Quality ("not more than 95.0 NTU") during work in the river".

   The Nevada Water Quality Standards for the Truckee River from McCarran to Idlewild is "not more than 12.0 NTU single value", (NAC 445.13466).

B. *Comments*

1 1. No provisions have been suggested to raise the bridge which crosses Steamboat Creek at Kimlick Lane. This road constitutes the only access to the Reno/Sparks JWTP.

2 2. No mention is made of the fact that the sludge beds of the Reno/Sparks JWTP wil be in direct line of flow of Steamboat Creek and the Truckee River during floods.

3 3. The sludge beds for the UNR Dairy, to the south of Kimlick Lane, would be especially prone to flood damage from Steamboat Creek since the recommended levees on both the north and south of Steamboat Creek would tend to funnel excess flow directly toward the sludge beds.

4 4. Should either or both the Reno/Sparks JWTP sludge beds or the UNR Dairy sludge beds be destroyed it could constitute a real health hazard for downstream residences.

5 5. It is not clear whether the proposed flood control work in reach 2 to 6 will increase flooding in reach 1. (see Figure 14 and Plate 4)

Sincerely,

R. Thomas

Richard Thomas
Surviellance & Monitoring Officer

RT/nd

RESPONSE TO NEVADA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES COMMENTS

1. The project features will not change the accessibility or inaccessibility of this road during large events.

2. The JWTP is currently building a sludge dewatering system. When completed, prior to project construction the sludge lagoons will be abandoned.

3. These sludge lagoons will be protected by project levees.

4. See responses 2-3.

5. Project features in Reaches 2-6 will not aggravate conditions in Reach 1.

RICHARD H. BRYAN
Governor

STATE OF NEVADA

~~ROLAND D. WESTERGARD~~
State Historic Preservation Officer

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF HISTORIC PRESERVATION AND ARCHEOLOGY
201 S. Fall Street
Capitol Complex
Carson City, Nevada 89710
(702) 885-5138

January 10, 1984

Colonel Arthur E. Williams
Department of the Army
Sacramento District
Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

1 The Division received a copy of the Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement on December 30, 1983. The documents purport that your agency has consulted with this office and is in compliance with current federal preservation legislation. This is not the case.

2 Presently, the draft documents do not adequately address cultural resources nor the effects of the project on such resources. In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and Advisory Council Procedures 36 CFR Part 800, a federal agency must take into account the effect of the undertaking on listed as well as National Register eligible properties. Federal agency actions include the identification and evaluation of historic properties. Although the downtown Reno bridges have been recorded by the Nevada Historical Society, they must still be evaluated for National Register significance. Additionally, the construction of levees, flood walls, detention basin, recreation facilities and other developments for fish and wildlife enhancement will necessitate an archeological/historical survey of project areas. Reports generated from such work plus recommendations must be forwarded to this office for review and comment.

3 Under law, your agency must provide the Advisory Council a reasonable opportunity to comment on the undertaking. This Division was not formally consulted regarding this project during the preparation of the documents. We urge you to contact us soon regarding the type of inventory that will be necessary to ensure that historic properties are appropriately considered.

28A

Revised July 1985

0-343

RESPONSE TO NEVADA'S STATE HISTORIC PRESERVATION OFFICER COMMENTS

1. "Not Applicable" has been changed to "Full Compliance". The statement "Full Compliance" refers to compliance with current stage of project planning not full compliance with the National Historic Preservation Act of 1966, as amended.

2. Additional information has been included in the final document Section 1.2, 1.4(1), 1.4(12), Table 1, and 6.2. The recommended plan would have an adverse impact on the Virginia Street Bridge, which is listed on the National Register of Historic Places and five additional bridges which may be eligible. Should the project be authorized for further studies an intensive cultural resources survey and evaluation would be conducted for the entire project area. All reports would be forwarded to the SHPO, ACHP and NPS for review.

3. A letter from the Advisory Council is included in this Section (p. 16; Attachment 1). The Council was contacted by telephone on 28 December 1983 and recommended evaluation of all resources prior to initiating the Section 106 consultation process. This will be accomplished during advanced studies.

If you have any questions regarding these comments, please call Alice Becker, the staff archeologist.

Sincerely,

ROLAND WESTERGARD
State Historic Preservation Officer

RW/lmw
cc: Al Downer, Advisory Council on Historic Preservation

City of Reno
POST OFFICE BOX 1900 • RENO, NEVADA 89505 • (702) 785-2000

April 5, 1984

District Engineer
Sacramento District
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

Attention: Mr. Allan Oto

RE: DRAFT FEASIBILITY REPORT AND DRAFT ENVIRONMENTAL IMPACT STATEMENT - TRUCKEE MEADOWS FLOOD CONTROL INVESTIGATION

Dear Mr. Oto:

The City Council of Reno recently passed a resolution supporting continuation of the flood control project for the Truckee Meadows. Enclosed you will find a copy of that resolution. If it does not fulfill the requirements for a "letter of intent" to proceed with the project, please inform us.

The visit by you and your colleagues from the Sacramento office on March 22, 1984 was very helpful and greatly appreciated. You capably addressed the primary local concerns with the project which had arisen since the publication of the referenced documents. For the record, the City of Reno will take this opportunity to express these major concerns.

The downtown redevelopment plan is nearing the start of construction. The recommended flood control plan does not encorporate the modifications of existing flood walls which will be done as part of the redevelopment. Your draft feasibility report mentions that the two plans are coordinated (pp. 134-135), but the draft Environmental Impact Statement mentions that the plan is only in partial compliance with the Downtown Reno Redevelopment Plan (p. EIS-7). The City's design engineering consultants have coordinated our design with your office and it is our understanding that it is compatible with channel capacity requirements for 100 year flood protection. We also understand that if the flood control project reaches the design stage, those areas of the river bank which have been renovated will be left undisturbed in the flood control project if the river can indeed carry the design flows. If there is a misunderstanding on our part, we would appreciate a formal reply to that effect.

1 Another local concern is that the draft feasibility report does not address the alternative of channelization with no detention basin, with mitigation downstream. The local concerns, of course, deal with the limited future development of the detention basin area. It is widely perceived in this area that lowering the reefs at Vista and mitigation downstream for increased flow rates would be a more cost effective alternative than the recommended plan. The meeting of March 22nd gave those in attendance a better understanding of the problems and expenses associated with the mitigation of downstream effects. We understand that an addendum to the report prior to its finalization will address this alternative.

2 City staff did not feel that an adequate explanation of the derivation of the benefit/cost ratio had been given in the report. Specifically, we were concerned that without that explanation, the calculated benefits appeared somewhat excessive. We understand that the above mentioned addendum will also contain a more comprehensive explanation of the methodology used in calculating the benefits derived from the flood control project.

3 One other concern we would call to your attention is the operation and maintenance of the Steamboat Marsh wildlife enhancement and recreation facility. We had addressed this issue in our comments on the draft Summary of the Recreation and Fish and Wildlife Plan (City of Reno letter dated March 1, 1983). There seems to be concurrence in the draft feasibility report that the initial costs should be 100% federal due to the habitat enhancement features for threatened and endangered species of birds and fish. We still feel that the U.S. Fish and Wildlife or the Nevada Department of Wildlife would be an appropriate agency to operate and maintain the facility. The designation of this area as a national or state park should be considered and proposed by the Corps in the final report. The scope and the regional nature of this feature would dictate stewardship by the experts at a state or federal level.

These then are our major concerns at this point in the Truckee Meadows Investigation. We anticipate an addendum to the draft feasibility report which will address these concerns to our satisfaction. Please let us know if the enclosed resolution does not satisfy the requirements for a letter of intent to proceed with the project.

Sincerely,

ROBERT M. JACKSON, P.E.
PUBLIC WORKS DIRECTOR

By: William N. Vann
William N. Vann, Jr., P.E.
Assistant Sanitary Engineer

RMJ:WNV:cwo

Enclosure

30

RESPONSE TO CITY OF RENO COMMENTS

1. Chapter 5, Section H-1, addresses the alternative of other plans without a detention basin. The detention basin alternative is the most economically feasible plan.

2. The benefit/cost ratio derivation was explained further in meetings held with City of Reno staff in summer 1984.

3. The Steamboat Marsh wildlife enhancement feature is proposed in the selected plan as a part of the FWS existing federal programs for endangered species and migratory birds. The features would be acquired and developed at 100 percent federal cost and would be administered by FWS after project construction.

RESOLUTION NO. 3970

INTRODUCED BY COUNCILMAN Scott

A RESOLUTION TO NOTIFY U.S. ARMY CORPS OF ENGINEERS THAT CITY OF RENO SUPPORTS FURTHER STUDY, DEVELOPMENT AND DESIGN OF A FLOOD CONTROL PROJECT FOR THE TRUCKEE MEADOWS.

WHEREAS, certain areas of the City of Reno are subject to periodic flooding from the Truckee River, causing serious damages to properties within these areas; and

WHEREAS, the City of Reno has supported the U.S. Army Corps of Engineers' Truckee Meadows Investigation, a study to produce a cost-effective flood control plan for the Cities of Reno and Sparks and Washoe County; and

WHEREAS, the Corps of Engineers has prepared a recommended plan and requires the City of Reno to indicate its support for the design of, and an effort to obtain U.S. Congressional funding for, this recommended plan; and

WHEREAS, such indication of support in no way commits the City of Reno to approval or funding any portion of the recommended flood control plan.

NOW, THEREFORE, BE IT RESOLVED, that this Council hereby:

1. Notifies the United States Army Corps of Engineers of its support of:
   a. continued study of the flooding problem in the Truckee Meadows,
   b. further investigation into cost-effective solutions to this problem,

c. design of the final recommended plan, and

d. request construction funds for the project from the United States Congress.

2. Notifies the United States Army Corps of Engineers that by this action at this time the City Council in no way commits the City of Reno to approval or funding any part of the lcoal share of construction of any flood control project.

On motion of Councilman Scott, seconded by Councilman Howard, the foregoing Resolution was passed and adopted this 13th day of February, 1984, by the following vote of the Council:

AYES: Scott, Howard, Lehners, Pine, Nunez, Sferrazza

NAYS: None

ABSTAIN: None ABSENT: Thornton

APPROVED this 13th day of February, 1984.

MAYOR OF THE CITY OF RENO

ATTEST:

CITY CLERK AND CLERK OF THE CITY COUNCIL OF THE CITY OF RENO, NEVADA.

The City of Sparks

PUBLIC WORKS DEPARTMENT

January 30, 1984

U.S. Army Corps of Engineers
Sacramento District
Attn: Investigation Section A
650 Capitol Mall
Sacramento, CA 95814

RE: Draft Feasibility Report and Draft Environmental Impact Statement - Truckee Meadows, Reno-Sparks Metropolitan Area, Nevada

Gentlemen:

The following are comments on the draft feasibility report and draft EIS that we wish included in the transcript of the public hearing.

Of major concern is what appears to be a lack of adequate investigation of a channel improvement alternative which would include lowering of the Vista reefs. In a study prepared by your office, dated October 1975, titled "Truckee River and Tributaries, California and Nevada Truckee Meadows Investigation, Channel Improvement Alternative", you indicated that lowering of the Vista reefs was a viable alternative. The study also indicated that that alternative had a positive benefit cost ratio and that further investigation was warranted. In reviewing the current report and draft EIS, there is barely mention of this particular alternative and certainly not enough information provided to eliminate this alternative from additional consideration. 1

On several occasions during the study phase and preparation of this report, City of Sparks staff has requested information from the Corps of Engineers concerning their investigation and evaluation of this channel improvement alternative. The City of Sparks was continually told that this alternative had been thoroughly investigated, that economic analyses had been prepared and that all of this information would be available when the draft report was published. Obviously, this has not happened and by this letter, the City of Sparks is formally requesting copies of raw data, calculations, and methods of evaluation used in determining the feasibility and cost of this alternative.

City Hall: 431 Prater Way, P. O. Box 857, Sparks, Nevada 89432-0857, (702) 356-2333

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RESPONSE TO CITY OF SPARKS, DEPARTMENT OF PUBLIC WORKS COMMENTS

1. Chapter V, Section H-1 explains alternative plans to detention basin. The detention basin alternative is the most economically feasible.

1 The City of Sparks realizes that by improving the channel and by not providing peak flow storage in the Truckee Meadows, downstream flows will necessarily be increased. The question would appear to be - does the cost of mitigating the impact of these increased flows in the downstream areas meet or exceed the project costs and mitigation measures in the Truckee Meadows?

Staff of the Corps of Engineers met on several occasions with representatives of the local jurisdictions concerning the location and impact of the Tahoe-Pyramid Link Highway in the vicinity of the Truckee River and the flood pool areas. The alignment study for the Tahoe-Pyramid Link and the information gathering period of this report were being conducted simultaneously. The Corps of Engineers staff was fully aware of the intent of the local jurisdictions in establishing the horizontal and vertical alignment of this major roadway. The local jurisdictions have in fact, since that time, formally adopted the alignment as it had been proposed. The construction of this roadway would have an obvious and significant impact on the flood control measures of this project, but there is little mention of the proposed roadway in the text of this report and no recognition at all in the graphic material provided.

2 Table 15 of this feasibility report is a listing of the Average Annual Equivalent Without Project Damages. I call your attention to Reach #10 shown on Figure 5 and the anticipated flood areas shown on Plate 4. As you can see, the entire area of Reach #10 is outside the 100-year floodplain. You may also notice that 75% to 80% of the area in Reach #10 is undeveloped and even though a significant portion is located inside the standard project flood area, the listed 4.429 million average annual equivalent damages is certainly inconsistent with values which you have calculated in Reaches 3 and 5. I would further suggest that you reevaluate Reaches 3 and 5 as the differences in damages estimated for these two reaches do not appear to be consistent with the area involved or the type and extent of development which is currently in place. I anticipate a substantial revision in the total average annual equivalent damages, which will obviously cause revisions to the benefit cost ratio.

Another area which could have significant impact on the benefit cost ratio would be in the calculation of benefits from the Recreation, Fish and Wildlife Plan. Without having the data and methodology used in calculating the supposed benefits, it is impossible to determine if the figures provided are valid. I will say that the estimated benefits indicated in the report are substantially higher than the City of Sparks staff can support without being provided additional information.

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2. A review of the data that was used to generate the average annual equivalents for reaches 3, 5, and 10 indicates that there are several valid reasons for the differences noted in the review comments. The average annual equivalent which is the end result of a series of calculations depends upon the interaction of several variables including: (1) the depths of the floodwaters, (2) the total value of damageable property (existing and future property), (3) the location of the damageable property (e.g., whether the property is located in the SPF, 100 year, 50 year or 25 year flood plain), (4) the floodproofing of future units (e.g., if units that will be built in the future are located in the SPF flood plain but not in the 100 year flood plain, they would not be required to floodproof under the provisions of the Flood Disaster Protection Act), and (5) the hydrology. A comparison of the floodwater depths, damageable property values for the SPF and 100 year flood plains (1982 and 1990 conditions), and expected damages (SPF and 100 year) for reaches 3, 5, and 10 indicates why some reaches have higher annual equivalents than others (see Table 1, 2, and 3).

Table 1 (Floodwater Depths)

	Reach 3	Reach 5	Reach 10
SPF	1'-5'	7'-14'	1'-9'
100	0.5'-3.5'	2.5'-7.5'	—
50	0'-3'	2'-4.5'	—
25	0'-1.5'	0'-3'	—

Table 2 (Damageable Property Values)
(In millions of dollars)

		Reach 3	Reach 5	Reach 10
SPF	(1982)	524	581	154
	(1990)	610	1,639	899
100 Year	(1982)	378	505	0
	(1990)	396	1,563	0

Table 3 (Expected Damages)
(In millions of dollars)

		Reach 3	Reach 5	Reach 10
SPF	(1982)	54	318	72
	(1990)	59	924	452
100 Year	(1982)	19	57	0
	(1990)	21	166	0

It is apparent that Reach 5 would have a higher average annual equivalent than the remaining reaches when one considers the information presented in Tables 1, 2, and 3. The reach has greater floodwater depths and larger damageable propery values for both the SPF and 100 year events.

The equivalent for Reach 10 is larger than the average annual equivalent for Reach 3 because of the anticipated future growth in that reach. The SPF damageable property value increases substantially from $154 million in 1982 to $899 million in 1990 while Reach 3 shows a much smaller increase ($524 to $610 million) for the same time period. The combination of higher depths of flooding and future growth which does not have to be floodproofed under current guidelines results in higher expected damages for Reach 10.

I refer you to the description of Alternative 11 on Page 151 of the feasibility report. The text indicates that the channel capacity below McCarran Boulevard would be 27,000 cfs to accommodate flows from Steamboat Creek. This channel capacity is not required for the entire distance below McCarran Boulevard inasmuch as the location of Steamboat Creek is approximately 2 miles downstream from the McCarran Boulevard bridge. 3

City of Sparks staff understands the need for flood control measures. We are, however, concerned that the plan being proposed may not be the best plan in light of other alternatives which are available and the additional comments as provided above.

Thank you for the opportunity to review and comment on this draft feasibility report and draft environmental impact statement.

Sincerely,

DAVID R. ROUNDTREE, P.E.
PUBLIC WORKS DIRECTOR

DRR:ks

cc: Mr. David L. Howard, Chairman
Washoe Council of Governments
Mayor Jim Spoo
Patricia Thompson, City Manager

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3. That channel capacity of 27,000 cfs was proposed in Alternative 11 as a way to minimize levee construction. The large channel would have also helped to contain backwater during large events.

REGIONAL ADMINISTRATIVE PLANNING AGENCY

RAPA

WASHOE COUNCIL OF GOVERNMENTS
REGIONAL PLANNING COMMISSION
OF RENO, SPARKS, AND WASHOE COUNTY

January 27, 1984

Sacramento District
Corps of Engineers
Investigation Section A
650 Capitol Mall
Sacramento, California 95814

Re: SPKED-W, November 4, 1983 - Staff Review

Gentlemen:

Our staff's comments on the above mentioned report follow:

Pg. 6 Washoe County Council of Governments should read Washoe Council of Governments.

Pg. 11 Additional water quality reports were prepared by the Washoe Council of Governments in 1979 and 1983.

Pg. 25 Sierra Pacific Power Company owns approximately 60,000 AF of surface water rights out of 220,000 AF of surface water rights decreed in the 1944 Orr Ditch Decree.

Pg. 27 New water quality standards were adopted by the Nevada Environmental Commission in 1979. The section on water quality should be revised to reflect the new standards. The Reno-Sparks Joint Water Pollution Control Plant has been renamed the Reno-Sparks Wastewater Treatment Facility. The Reno-Sparks Wastewater Treatment Facility has been expanded to 30 MGD with phosphorus removal (advanced secondary) and grant funds have been requested to expand it to 40 MGD with phosphorus and nitrogen removal (full tertiary).

Pg. 29 Air Quality Section: The Truckee Meadows Air Basin also does not include Spanish Springs Valley north of Sparks, and Verdi west of Reno.

Pg. 31 Dust from construction sites used to be the most significant source of airborne particulates in the Reno area. Fireplaces and woodstoves are rapidly taking its place as the most significant source.

P.O. Box 1331 / 241 Ridge St. / Reno, NV 89504 — 1331 / (702) 785-4043

Pg. 37 The silt delta impediment has been removed through construction of the Marble Bluff Dam and Fishway in 1975.

Pg. 38 The Cui-ui spawned only as far up as the McCarran Ranch at Patrick.

Pg. 55 The Truckee River from Stateline to Pyramid Lake is more than 68 miles. More like 86 miles.

Sierra Nevada Museum of Art.

Pg. 59 The main sources of revenue for local government is the state sales tax, with property taxes next. Main sources for state government are gaming taxes.

Pg. 65 West Sparks should be changed to East and South Sparks.

Pg. 76 The reference to average annual flood damages should be explained in more detail and Table 15 should be referenced.

The flood plain should be changed to the 100 year and SPF Flood Plains.

Pg. 78 JWPCP should be changed to WWTF.

Pg. 79 JWPCP = WWTF. Storey County was deleted from the Washoe Council of Governments 208 planning boundaries in 1978.

Pg. 80 Effective October 16, 1980, require sedimentation facilities...should be changed to require the application of best management practices as delineated in the 208 Water Quality Management Plan adopted for the Region.

Pg. 83 Fish habitat in the Truckee River below Vista cannot, at this time, support sustained populations of cold water fish...

Pg. 85 Rewrite the first sentence in Section E: "Sierra Pacific Power Company provides water service to most of the present population of the greater Truckee Meadows.."

Pg. 86 During drought periods ground water may be pumped at a safe yield of 12,000 acre-feet/year.

Pg. 88 The statement implying that the area above Lake Tahoe does not need to be considered is questionable. This winter Lake Tahoe is near capacity. A major rainstorm in

1

that basin could seriously add to the Truckee's volume, depending in part on the Federal Water Masters decisions.

1 Due to the extremely heavy precipitation the last two years, Lake Tahoe has been full. What would happen with the Lake full, a heavy snow pack, and a warm rain hit? Would Lake Tahoe outflow compound flooding on the Truckee River in the Truckee Meadows or would the Tahoe gates still be closed even though properties at the Lake may be flooded?

Pg. 98 Gray, Bronco, and Juniper Creeks have serious erosion problems due to past logging and grazing activities.

pg. 116 Table 12 needs to be broken down to the 100 Year Flood Plain and by reach to make it more understandable and usable.

Pg. 118 Same comment as Table 12.

Pg. 119 Same comment as Table 12.

2 Pg. 107-123 Basis of Economic Analysis The WCOG staff needs to understand this section very thoroughly. If it is assumed that the Region will proceed with the flood insurance program and require flood proofing or elevation do the damages estimates change?

Pg. 134 Consideration of plans of others.
Where extensive coordination has occured this should be explained (see appended letters).

Pg. 148 Toiyabe National Forest, not Park.

3 Pg. 157 Alternate 2 - Nonstructural Plan
The two cities and the County will participate in the National Flood Insurance Program. How will this not resolve the problem? Are you saying that too much building has already occurred and would not likely be retrofitted in the near future?

The Staff believes this alternative should be costed out in order to adequately compare the structural and non structural solutions.

Pg. 158 Alternate 8 - Triubtary should be Tributary.

RESPONSE TO WASHOE COUNCIL OF GOVERNMENTS COMMENTS

1. The area is considered in that the peak is brought into the recession side of the hydrograph. It is assumed during the design storm that Lake Tahoe will not make any releases. The Federal Water Master opens and closes all of the gates.

2. This section was explained thoroughly during meetings held with WCOG in the summer 1984.

3. This section has been expanded.

Pg. 168- Plan for Further Consideration
This section should be expanded to include a table that compares the cost including the purchase of flowage easements down the canyon of the Channel-Levee Plan with and without the overflow area. 4

As you wil recall the local jurisdictions passed resolutions in 1981 that responded to the alternatives listed in the document entitled "Truckee Meadows Investigation, Alternative for Flood Control and Related Water Resources Problems, July 1980" (appended).

These resolutions should be responded to in this section. Most of the material is there but is not organized in a manner that responds to the resolutions.

Pg. 181 Item E - The North Truckee Drain diversion should be North Truckee Ditch. This should be changed throught the remainder of the report.

Pg. 194 Turbidity levels should be changed to the Nevada State Standards for Truckee River.

Pg. 195 1. Flood Control
Again as Staff indicated previously y a no action alternative - with project comparison does not consider the participation of Reno, Sparks, and Washoe County in the National Flood Insurance Program and the reduction in damages that will result and what it will cost to flood proof or elevate all future development or rehabilitate existing development? 5

Pg. 215 Sparks Water Treatment Plant should be changed to Glendale Water Treatment Plant. Glendale Ditch Diversion Dam should be changed to North Truckee Ditch Diversion Dam. What happens to the Pioneer Ditch and Glendale Ditch Diversions that are down stream from the Glendale Water Treatment Plant?

Pg. 219 Is Kimlick Bridge also replaced?

Pg. 227 The Flood Control Federal and non Federal costs are not the same as those listed on Page 233. To be consistent operation and maintenance costs for each portion of the project should be listed.

Pg. EIS-15 Publication of the FEMA designated floodway is pending. Preliminary information indicates that the floodway could include areas.....

4. Chapter V, Section H-1 now discusses alternatives to the detention basin. The detention basin alternative is the most economically feasible.

5. See the Nonstructural and No Action sections which have been expanded.

Pg. EIS-17 North Truckee Drain should be North Truckee Ditch.

Pg. EIS-24 Reno-Sparks Joint Water Pollution Control Plant should be Reno-Sparks Wastewater Treatment Facility.

Pg. EIS-44 North Truckee Drain should be North Truckee Ditch.

Pg. EIS-50 North Truckee Drain should be North Truckee Ditch.

Pg. EIS-53 *Mention should be made of the resolutions sent to the* Corp. in 1981 as a result of the July 1980 public workshops.

Pg. EIS-58 Crowe....Director, delete Director.

404(b)(1) Evaluation

Pg. 2 Diversion structures ... North Truckee Drain should be North Truckee Ditch. Purposes for diversions are reversed in paragraph.

Pg. 6 North Truckee Drain should be North Truckee Ditch.

Pg. 9 Turbidity levees should be levels.

The Council's staff appreciates the opportunity to review the Corps report and looks forward to receiving the Corps responses.

If there are any questions or further information needed please do not hesitate to call Leonard E. Crowe Jr. (702-785-4578) in our office.

Sincerely yours,

Robert N. Young
Executive Director

RNY:LC:tjs

Attachments

40

WASHOE COUNTY

"To Protect and To Serve"

DEPARTMENT OF PUBLIC WORKS
FLOYD VICE, P.E., DIRECTOR

1205 MILL STREET
POST OFFICE BOX 11130
RENO, NEVADA 89520
PHONE: (702) 785-4101

February 17, 1984

Sacramento District, Corps of Engineers
650 Capitol Mall
Sacramento, California 95814

ATTN: Investigations Section A

Dear Sir:

The Washoe County Public Works Department is in receipt of the Draft Feasibility Report and Draft Environmental Impact Statement dated October 1983 for the Truckee Meadows Area, Nevada.

We have not received any negative comments from either the Washoe County Manager's Office or the Washoe County Commissioners regarding the aforementioned report and cannot, therefore, forward any specific concerns on their behalf. The Public Works Department does not have any concerns to pass along to you at this time, either.

Thank you for the opportunity to review the document.

Sincerely,

FLOYD VICE
Public Works Director

By Kirk Nichols
KIRK NICHOLS, P.E.

KN/cs

WASHOE COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER

RESPONSE TO WASHOE COUNTY, DEPARTMENT OF PUBLIC WORKS COMMENTS

No additional response needed.

Sierra Pacific Power Company

January 30, 1984

District Engineer
U. S. Army Engineer District, Sacramento
Corps of Engineers
Attn: SPKED-W (Inv. Sec. A)
650 Capitol Mall
Sacramento, CA 95814

Re: Truckee Meadows Investigation

Dear Sir:

Sierra Pacific Power Company has carefully reviewed the "Draft Truckee Meadows Feasibility Report and Environmental Impact Statement" and we provide the following comments.

UTILITY RELOCATIONS

Please find enclosed a listing of Sierra Pacific Power Company facilities (i.e., gas, water and electric) which cross the Truckee River in the project vicinity.

Table 28 identified utility relocation costs for each reach of the river. Note that no electric distribution line relocation costs appear in this table. A 4kV and 23kV electric distribution line cross the Truckee River on the Sierra Street and Center Street Bridges respectively. Reconstruction of these two structures will require relocation of these electric facilities. 1

Please identify Sierra Pacific Power Company gas and water facilities that are targeted for relocation per Table 28.

Should this project be constructed, close liaison must be maintained with Sierra during constrauction to minimize service interruption.

CONSTRUCTION EFFECTS

Sierra's Glendale Water Treatment Plant is located approximately one-fourth mile downstream of the E. 2nd Street Bridge. Any construction upstream of this facility will greatly impact it. The Draft Feasibility Report on page 194 states the following: "Turbidity levels downstream of construction sites will meet the State Water Quality Standards ("not more than 95.0 NTU") during work in the river." Currently the turbidity standards for the Truckee River at the Glendale Water Treatment Plant are the following:

Annual Average..... Not more than 7.0 NTU
Single Value..... Not more than 12.0 NTU

The Glendale Water Treatment Plant is capable of treating an influent turbidity value of 10 NTU; however, treatment capacity diminishes when the influent turbidity exceeds 10 NTU. Construction mitigations must be imposed so that turbidity values at Glendale do not exceed 10 NTU.

P. O. BOX 10100/ RENO, NEVADA 89520/ TELEPHONE 702/ 789-4011

RESPONSE TO SIERRA PACIFIC POWER COMPANY COMMENTS

1. Facilities owned by Sierra Pacific Power Company to be relocated are as follows:

Water	24"	155 ft. +/- upstream of Booth Street Bridge
Water	12"	Sierra Street Bridge
Gas	4-1/2"	Sierra Street Bridge
Power	4 Kv	Sierra Street Bridge
Water	8"	Virginia Street Bridge
Power	23 Kv	Center Street Bridge
Gas	4"	Pembroke Bridge crossing Steamboat Creek

The proposed relocations of the aforementioned utilities, the North Truckee Drain Diversion Dam and appurtenant facilities will be coordinated with Sierra Pacific Power Company during detailed design.

Sierra Pacific Power Company maintains the North Truckee Drain Diversion Dam and appurtenant facilities. Any Corps of Engineer work involving these facilities must be reviewed by Sierra.

2 Plate 8 shows a flood wall and levee contiguous to our Glendale Water Treatment Plant property. Do these flood control facilities encumber this parcel? Any flood control facility constructed adjacent to the Glendale Water Treatment Plant (including point of diversion) must be designed/engineered to maintain maximum facility security.

POST CONSTRUCTION EFFECTS

3 Stabilization of disturbed construction areas must be designed to minimize short term as well as long term impacts on the Glendale facility. Also, application of fertilizers during revegetation endeavors must be discouraged because of the potential impacts on the algae and diatom blooms upstream of Glendale.

Thank you for the opportunity to review and comment on the "Draft Truckee Meadows Feasibility Report and Environmental Impact Statement." Should you have any questions regarding Sierra's comments, please call me at (702) 789-4754.

Very truly yours,

Frank Luchetti

Frank Luchetti
Environmental Specialist

FJL/ks

2. The flood control features contiguous to the Glendale Water Treatment Plant property will require that appropriate access to project features be available to the local sponsor in order for them to perform their operation and maintenance responsibilities. Any impacts to facility security caused by subject project structures will be minimized. Any existing fencing or gates will be relocated as necessary.

3. All disturbed areas will be reseeded with appropriate grasses and forbs to minimize surface erosion. The potential impacts on water quality due to the use of fertilizers will also be considered during the advanced design stages.

SIERRA PACIFIC POWER COMPANY
FACILITIES CROSSING TRUCKEE RIVER IN PROJECT VICINITY

GAS TRANSMISSION LINES

Booth Street Bridge - 4"
Sierra Street Bridge - 4"
East 2nd Street Bridge - 4"
Glendale Avenue Bridge - 8"
Vine Street (under the river) - 8"
Park Street (under the river) - 12"
McCarran Blvd. (under the river) - 12"

WATER TRANSMISSION LINES

Sierra Street Bridge - 12"
Virginia Street Bridge - 8"
2nd Street Bridge - 18"
Glendale Avenue Bridge - 12"
Rock Blvd. Bridge - 12"
West of Booth Street Bridge (under the river) - 24"
Vine Street (under the river) - 24"
Park Street (under the river) - 12"
Between Greg and Rock (under the river) - 36"
East of McCarran Bridge (under the river) - 16"

ELECTRIC DISTRIBUTION LINES

Sierra Street Bridge - 4kV
Center Street Bridge - 23kV

Sierra Pacific Power Company

February 2, 1984

District Engineer
U.S. Army Engineer District, Sacramento
Corps of Engineers
Attn: SPKED-W (Inv. Sec. A)
650 Capital Mall
Sacramento, CA 95814

Re: Truckee Meadows Investigation

Dear Sir:

Please amend Sierra Pacific Power Company initial comments to reflect that the Glendale Water Treatment Plant is located approximately one-fourth mile downstream of the Glendale Avenue Bridge.

Should you have any questions regarding this matter please call me at (702) 789-4754.

Very truly yours,

Frank J. Luchetti

Frank J. Luchetti
Environmental Specialist

FJL/ks

P. O. BOX 10100/ RENO, NEVADA 89520/ TELEPHONE 702/ 789-4011

UNIVERSITY OF NEVADA RENO

Physical Plant Department
University of Nevada Reno
Reno, Nevada 89557-0057
(702) 784-6514

February 8, 1984

Mr. Allen K. Oto, PE
U. S. Army Corps of Engineers
Federal and Courthouse Building
650 Capitol Mall
Sacramento, California 95814

Dear Mr. Oto:

RE: Truckee Meadows Flood Control Plan

46

1 This letter will formally record the University of Nevada-Reno's opposition to the proposed Truckee Meadows Flood Control Plan. The University land which will be affected by the flood control plan is assigned to the College of Agriculture and used for Agricultural Research. Several references have been made to this land being farm land. All of the University land is used as an Experimental Field Laboratory.

2 The use of research land for flood control purposes would have a serious impact on research projects and would require purchasing another facility. This would be extremely difficult because of the distance from campus where other land might be available. The land must be near the main campus because of student travel.

We encourage you to consider an alternative flood control plan to avoid moving our Experimental Field Laboratory.

Sincerely,

Brian J. Whalen
Director

BJW/jg

cc: Ashok Dhingra
Bernard Jones
Leonard Crowe

RESPONSE TO UNIVERSITY OF NEVADA, RENO COMMENTS

1. The references to university experimental lands as farmlands have been revised.

2. The detention basin alternative is the most economically feasible alternative. Flood protection will be provided to the detention basin lands by the project for more frequent events (up to 50-year). Storage requirements within the detention basin would result in increased depths over preproject conditions during the larger, more infrequent events (50-100 year).

LAW OFFICES OF

EISENHOWER, CARLSON, NEWLANDS, REHA, HENRIOT & QUINN

C. JOHN NEWLANDS
JOHN J. REHA, JR.
JAMES F. HENRIOT
H. EUGENE QUINN
RONALD A. ROBERTS
S. ALAN WEAVER
PAUL T. MURRAY
RICHARD D. TURNER
RICHARD A. JESSUP
MICHAEL R. THORP

MACK D. LIEVENSE
JAMES M. HUSHAGEN
KATHRYN J. NELSON
DONALD L. ANDERSON
MARC H. COCHRAN

REUBEN C. CARLSON
MERTON ELLIOTT
OLIVER MALM
OF COUNSEL

1200 FIRST INTERSTATE PLAZA
TACOMA, WASHINGTON 98402

EDGAR N. EISENHOWER (1971)
CHARLES D. HUNTER, JR. (1965)
GUY T. ELLIOTT (1978)

TELEPHONE
572-4500
AREA CODE 206

January 30, 1984

U.S. Army Corps of Engineers
Sacramento District
650 Capitol Mall
Sacramento, CA 95814

ATTENTION: Investigations Section A

Dear Sir:

This firm represents the Pyramid Lake Paiute Tribe. We are in receipt of the following documents:

1. Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement.
2. Information Brochure - October 1983 - Truckee Meadows (Reno-Sparks Metropolitan Area) Nevada.
3. Truckee Meadows Investigation (Reno-Sparks Metropolitan Area) Nevada - Endangered Species Biological Data Report.

Our comments on the above-referenced documents are as follows.

First of all, the Pyramid Lake Tribe continues to believe that the Truckee Meadows flood control investigation should be expanded to include not only the Reno-Sparks area but the entire Truckee River south of the Truckee Meadows, including that portion of the river on the Pyramid Lake Indian Reservation.

We believe that the expansion of the Truckee Meadows investigation to include the lower Truckee River is required for three reasons. First, it would appear that the resolution adopted by the Senate Committee on Public Works on February 7, 1964 intended that the lower river be included in the investigation. That resolution reads as follows:

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RESOLVED by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under §3 of the Rivers and Harbors Act, approved June 13, 1902, be and is, hereby requested to review the report of the Chief of Engineers on Truckee River and tributaries, California and Nevada, published as House document No. 497, 83rd Congress and other pertinent reports with a view to providing additional flood protection to the area known as Truckee Meadows at and below Reno, Nevada.

1 Second, for many years now, tribal land along the lower Truckee River has been subjected to severe erosion and flooding. Therefore, since the Corps of Engineers is studying flood control in the Reno-Sparks area, it would seem to make sense to also include within the study that area below Reno and Sparks.

Third, we believe that an assessment of the impacts of the Reno-Sparks area flood control project cannot be adequately assessed without taking into consideration impacts on the lower river. Previous flood control projects in the Truckee Meadows area have conclusively demonstrated that changes in river hydrology in that area can have major impacts on the lower river. Therefore, the lower river should be included within the present Truckee Meadows investigation.

The Pyramid Lake Tribe is pleased that the Draft Environmental Impact Statement takes into consideration the potential impacts of the project on the endangered cui-ui and Lahontan cutthroat trout of the Truckee River. The Tribe was also pleased to learn that by letter dated December 27, 1983, the Corps of Engineers requested formal consultation and a biological opinion on the project from the United States Fish and Wildlife Service.

As the planning and implementation phases of the flood control project move forward, the following points should continue to be addressed by the Corps of Engineers:

2 1. Any proposed changes in river hydrology, temperature or turbidity levels during or after construction should be analyzed for potential impacts on cui-ui or cui-ui habitat in the lower Truckee River.

RESPONSES TO LAW OFFICES OF EISENHOWER, CARLSON, NEWLANDS, REHA, HENRIOT AND QUINN ATTORNEY, PAIUTE LAKE INDIAN TRIBE COMMENTS

1. Our interpretation of the study resolution is to study the "Truckee Meadows" areas which extend from just upstream of Reno to Vista. Our study included an analysis of potential impacts to downstream areas, and the selected plan includes features to prevent increases in downstream flows.

2. The features of the selected plan are partly due to considering potential impacts on cui-ui. The flood control features are designed to minimize impacts. The enhancement described in the final EIS (Section 5.3) will improve the habitat for both the cui-ui and Lahontan cutthroat trout.

2 2. As with the cui-ui, potential impacts on the Lahontan cutthroat trout should be considered with regard to the trout inhabiting the lower river as well as the trout inhabiting the project area.

3 3. Trees and other vegetation lining the river should not be removed unless absolutely necessary. In the cases where such removal is necessary, replacement vegetation should be planted as soon as possible and effective measures taken to insure that the vegetation survives.

4 4. The project should be designed to insure that river velocity is not increased in the lower river as a result of upstream modifications. The Pyramid Lake Tribe supports the concept of a peak flood flow detention area.

1 The Pyramid Lake Tribe joins its upstream neighbors, Reno and Sparks, in their concerns regarding the potential damage from Truckee River floods. The Tribe supports any flood control project in the Reno-Sparks area which will not result in adverse impacts on Pyramid Lake and the Pyramid Lake Indian Reservation. The Tribe believes that the best way to avoid such adverse impacts is to include the lower river as part of the Truckee Meadows Investigation. The Tribe invites the Corps of Engineers to include the lower river as part of the Truckee Meadows Investigation.

If you have any questions, please give us a call.

Very truly yours,

Michael R. Thorp

Michael R. Thorp
Tribal Attorney, Pyramid
Lake Paiute Tribe

MRT/cwp
cc: Roy Garcia, Tribal Chairman
Robert Pelcyger
Scott McElroy
Alan Ruger

3. Section 5.3 of the final EIS describes mitigation and enhancement measures.

4. Project features will not increase velocity in the lower river.

LAW OFFICES OF
STEPHEN C. MOLLATH
A PROFESSIONAL CORPORATION

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January 26, 1984

U. S. Army Corps of Engineers
Sacramento District
ATTENTION: Investigators Section A
650 Capitol Mall
Sacramento, CA 95814

Re: CEC 80-3355-003
Flood Control Studies
Bella Vista Ranch
Reno, Nevada

To whom it may concern:

Enclosed you will find, pursuant to and for inclusion in the record of your hearing dated January 12, 1984, the comments of the Bella Vista Ranch on your proposed flood control studies.

1 Obviously the Bella Vista Ranch opposed your plan of artificially shifting the flood impact to its property. This shift will cause damage to the Bella Vista in regard to its highest and best use potential development and will constitute a "taking" of its property by inverse condemnation.

Please put the Bella Vista on record of opposing your plan and notice is hereby given of the potential damage (physical and monetary) to the ranch.

Sincerely,

STEPHEN C. MOLLATH, P.C.

Stephen C. Mollath

SCM:sc

Enclosures

cc: Paul Butler, Jr.

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RESPONSE TO ATTORNEY FOR BELLA VISTA RANCH COMMENTS

1. The project proposes to acquire flowage easements in order to obtain the rights to continue to periodically flood this land. The estimated cost for all land is based on our analysis of highest and best use for the land.

M E M O R A N D U M

TO: Bella Vista Ranch, c/o Stephen Mollath, Esq.

FROM: Michael L. Bergstrom, Hydrologist, Chilton Engineering, Chartered

RE: Impacts to Bella Vista Ranch from Proposed U.S. Army Corps of Engineers Flood Control Improvements in Truckee Meadows C.E.C. 80-3355-003

DATE: January 23, 1984

==========

This memorandum is a review of the Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement published by the U.S. Army Corps of Engineers in October, 1983 and presented at a public meeting on January 12, 1984 in Reno, Nevada. References to Figures, Plates, Tables and text in the following are from this report unless otherwise noted. Copies of the more significant Figures and Plates are included with the memorandum.

Historically, the eastern Truckee Meadows has served as a flood detention basin for persons and property downstream of the Meadows along the Truckee River. The size of flow path of the Truckee River is significantly reduced by geologic control at Vista. This area behaves similar to a flood control dam, reducing peak flows downstream by "storing" flood water in eastern Truckee Meadows. Substantial reductions in river channel gradient across the Meadows also contribute to the flooding. The proposed Corps of Engineers flood control improvements were designed to achieve the same downstream results (i.e., peak flows) while reducing the flooded areas in the eastern Truckee Meadows.

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The flow frequency analysis and channel hydraulics modeling performed by the Corps of Engineers appear to provide reasonable estimates of flow frequencies and peak flows (Figures 1, 2, 3, and 4) and flood plains (Plate 4 and Figure 5) for the preproject 100-Year and Standard Project Flood (SPF). The upper parts of Bella Vista Ranch are located in Reach 11 and the southeastern part of Reach 7 (Figure 5). Reach 11 was described as "primarily an agriculture area." Reach 7 was described as "once predominantly agricultural land. This area has grown rapidly in the last five years, and there is additional pressure to further develop the remaining land, with the exception of the wetlands."

Damages from inundation by the preproject flood were estimated for present and future land uses and the vulnerability of property to damages. Future land uses were estimated for the year 1990 and assumed constant thereafter (Table 12). The report fails to delineate present and future land use and their associated damages by reach (Table 13 and 14). Probable average annual damages were estimated by reach (Table 15). Reach 7 showed a large average annual damage while Reach 11 showed very little. Lacking more detailed explanation, average annual damages appear to be

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2. See Tables 12A-C for delineation of present and future land uses by reach. The damages by reach are already presented in Table 15. The average annual equivalents for each reach are the end result of a series of calculations that depend upon the interaction of several variables including: (1) the depths of the floodwaters, (2) the total value of damageable property (existing and future units), (3) the location of the damageable property (e.g., whether the property is located in the SPF, 100 year, 50 year or 25 year flood plain), (4) the hydrology, and (5) the floodproofing of future units. This interaction results in the variations in average annual damages.

Projections of future growth for the Truckee Meadows Study was based upon local and regional population projections, local land use plans, and zoning maps and ordinances. In all of our analyses, we assume that the first floor of all future development within the 100 year flood plain will be elevated to the level of the 100 year flood in compliance with the Flood Disaster Protection Act. Future flood damages and project benefits are reduced when the act is implemented.

2 weighted heavily toward present land use and may not include realistic future land use.

Various flood control improvements were evaluated and the "Channel Levee Plan," for the 100-Year Flood event, (Figure 10) was determined most feasible. This includes bridge replacements, channel modifications, floodwalls and levees. For Reaches 7 and 11, as first proposed, a levee would run the length of Steamboat Creek on the west bank, from Huffaker Hills north through Bella Vista Ranch to the confluence of Boynton Slough. This levee would restrict flood flows to the east of the levee up against the foothills of the Virginia Range, leaving the majority of the ranch safe from inundation and developable to its highest use.

Further flood flow analysis indicated that Steamboat Creek above Boynton Slough does not meet Corps of Engineers criteria for inclusion into their flood control improvements. Consequently, the proposed levee along Steamboat Creek was shifted west to provide only backwater levees for existing residential areas between Boynton Slough and Huffaker Hills. Local authorities could pursue the Corps' first levee proposal independently, if they desired.

Proposed channel improvements in Reno-Sparks will increase potential peak flows at Vista resulting in increased downstream damages. Downstream damages and/or channel improvements were not considered cost effective. The report failed to describe in detail either the downstream damages or improvements which could mitigate the increased flows. Alternatively, a flood detention basin adjacent to the Truckee River was proposed to protect the downstream areas. These features were incorporated in "Selected Flood Control Plan" (Figure 11 and Plates 9 through 11). Levees with an average height of 10 feet would be used to create the flood detention area and 10.5 foot levees would protect areas along Steamboat Creek and Boynton Slough. Under the Corps' plan, the flood plain area on Bella Vista Ranch in Reaches 7 and 11 is essentially the same as before (Figure 14). The presence of an upstream detention area and levees could possibly increase water depth and sedimentation on Bella Vista Ranch by reducing flow rates in Steamboat Creek due to increased backwater effects. In addition to omitting a detailed discussion of downstream damages and possible improvements, the report briefly mentioned the proposed Tahoe-Pyramid Lake Highway, and did not analyze the route and probable design as an alternative or complement to the proposed levees along Steamboat Creek and Boynton Slough.

The cost of flood control improvements along Steamboat Creek and Boynton Slough includes purchase of permanent and flowage easements, and acquisition of land. Cost of permanent easements are estimated at fee value due to limitations of land use. Cost of flowage easements are estimated at twenty-five percent (25%) of fee value. Total cost (October 1982 prices) of right-of-way requirements are estimated at $3,570,000 for Steamboat Creek and $300,000 for Boynton Slough (Table 27).

In summary, full development of Bella Vista Ranch, to its highest use may be restricted, due to implementation of the Corps' plan or erroneous interpretations of their feasibility study. Several areas of the feasibility study require further analysis to fully justify restricting development on Bella Vista Ranch, including:

1) detailed analysis of downstream damages and possible improvements as an alternative to construction of the flood detention area.

2) inclusion of Tahoe - Pyramid Link Highway in design of proposed levees along Steamboat Creek between Huffaker Hills and Truckee River.

3 | 3) adjustments to damage estimates and right-of-way costs to reflect the highest use for property along Steamboat Creek.

Michael L. Bergstrom

Michael L. Bergstrom, Hydrologist
Chilton Engineering, Chartered

3. The flood damage estimates include existing and future conditions. Projections of future growth were based on local and regional population projections, local land use plans, and ordinances. Direct interviews were conducted during the field surveys. The estimated cost of flowage easements was based on highest and best use.

Attachment 2

Section 404(b)(1) Evaluation

SECTION 404(b)1 EVALUATION

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SECTION 404(b)1 EVALUATION

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404(b)(1) Evaluation

Truckee Meadows Investigation
(Reno - Sparks Metropolitan Area), Nevada

Introduction.

In accordance with the Clean Water Act (33 U.S.C. 1344), and other pertinent laws and regulations, the placement of dredged or fill material below ordinary high water into the waters of the United States or their associated wetlands requires an evaluation of water quality considerations associated with the action. The potential flood control project for Truckee Meadows involves placement of fill material into the Truckee River, Boynton Slough, and Steamboat Creek. This evaluation was accomplished to qualify the investigation for exemption from ER 1105-2-50 (paragraph 4.3 b(1)).

I. Project Description

a. Location. - Truckee Meadows is located in Washoe County in western Nevada. The study area includes the Truckee River from the western end of the Reno City limits to Vista, Nevada; that portion of Steamboat Creek north of Huffaker Hills which extends through the University of Nevada Agricultural Experiment Station; and Boynton Slough east of Boynton Lane.

b. General Description. - Chapter VI of the feasibility report contains a detailed description of the selected plan. The following is a summary of the features requiring evaluation under Section 404 of the Clean Water Act:

(1) Floodwalls and setback floodwalls would be constructed or reconstructed along the north bank between Booth Street and Lake Street, and on the south bank between Washington Street and Lake Street.

(2) Bridges would be reconstructed and/or replaced at or above grade at Arlington Avenue, Booth, Virginia, Lake, Sierra, and Center Streets. The footbridges at Wingfield Park would also be elevated.

(3) Channel excavation is proposed along the north bank in the vicinity of Booth Street bridge, and excavation would also take place through the stream channel to a maximum depth of 1.5 feet from just above Arlington Avenue bridge to just above Sierra Street bridge. The total river distance involved is approximately 1,600 feet. The excavated material would be placed in upland locations.

(4) From US Highway 395 to Glendale Avenue, setback floodwalls are planned for the south bank only.

(5) The North Truckee Ditch diversion dam just above Glendale Avenue would be reconstructed and realigned.

(6) Between Glendale Avenue and South Rock Boulevard there would be setback floodwalls and setback levees.

(7) Between South Rock Boulevard and South McCarran Boulevard there would be setback floodwalls, floodwalls at the river's edge, and setback levees.

(8) In the area of Glendale Park, 5.6 acres along the north bank would be excavated above the water surface elevation of the Truckee River associated with 1,000 cfs discharge (estimated average annual flow).

(9) Between South McCarran Boulevard and the east end of the project at Vista, setback levees would be built on both sides of the river. These levees would be about 11 feet high and 82 to 90 feet wide at the base.

(10) From the confluence of North Truckee Drain (NTD) and the Truckee River, backwater levees will be built along NTD to approximately 900 feet North of I-80 crossing.

(11) Immediately east of the University of Nevada Agricultural Experiment Station (UNAES) on South McCarran Boulevard, a 1,000-foot overflow weir would be built and approximately 7 acres excavated from the south bank of the Truckee River and adjacent agricultural land.

(12) The UNAES would be surrounded by 10-foot levees and serve as an overflow area to temporarily store peak flows of floods greater than a 35-year event. This is intended to preclude increased flood peaks for areas downstream of the project. An overflow weir and low level outlet structure would be located along the east side levee to release flows back into the Truckee River.

(13) Levees with an average height of 10.5 feet would be constructed along Steamboat Creek and Boynton Slough. Pembroke Drive bridge over Steamboat Creek will be raised and lengthened to provide for more flow under the bridge.

(14) The project features have been designed to allow for controlled overtopping when the design capacity has been exceeded. The controlled overtopping will prevent levee failure and route the excess floodwaters to the same areas they would go to without the project. Also interior drainage provisions are included to evacuate excess ponding behind protective works.

(15) Boulder Emplacement. - Groups of large boulders would be added to the river at Booth Street and Arlington Avenue to provide additional cover habitat for young and adult fish. Other selected locations would also receive this type of habitat enhancement.

(16) The Steamboat Marsh Nature Area. - This area would be developed to enhance open water and marsh habitats by construction of dikes for water level control. Also, nature trails and a pedestrian/bicycle path would be constructed in the marsh area.

(17) The selected plan would also involve relocating or replacement of utilities within the construction area. The material discharged in the installation of the utilities is authorized under a Nationwide Permit contained in 33 CFR 330.5(a)(12).

c. Authority and Purpose. - The investigation was authorized by the 7 February 1964 resolution of the Committee on Public Works of the United States Senate, with particular reference to provide additional flood protection to Truckee Meadows at and below Reno. The investigation was suspended in fiscal year 1970 due to lack of support, but resumed in 1976 at the request of Washoe County, and the Cities of Reno and Sparks. The primary purpose of the investigation is to provide improved protection from flooding to the Reno-Sparks Truckee Meadows area.

d. General Description of Fill Material.

(1) General Characteristics of Material. - The construction material would include commercially obtained sand and concrete, soil embankment, quarry run stone, and streambed cobbles.

(2) Quantity of Material. - Approximately 1 million yards of embankment material and 50,000 tons of quarry stone, are estimated.

(3) Source of Material. - Sources of material are summarized below:

- Embankment material from the Mira Loma Borrow Pit
- Quarry stone from the Southern Pacific Transport Company's quarry which is operated by Helms Construction Company and located on the eastern outskirts of Sparks near I-80
- Sand and concrete from commercial sources within 10 miles of the project

e. Description of the proposed discharge sites.

(1) Location. - The discharge sites are located on the banks and within the channel of the Truckee River, North Truckee Drain, Boynton Slough, and Steamboat Creek.

(2) Type of Sites. - The discharge sites are dewatered river bottom, exposed slopes of all excavated channels, approach and exit channel side slopes at all bridges, and wetland sites.

(3) Type of Habitat. - The discharge sites are:

- Aquatic habitats that would be classified as a Riverine, Upper Perennial, Unconsolidated Bottom habitat under the Fish and Wildlife Service National Wetland Inventory (NWI)
- Wetland habitat which would be classified as Palustrine-Emergent; Palustrine Scrub-Shrub, and Palustrine Forested Wetlands under the NWI

(5) Timing and Duration of Discharge. - The discharge would probably begin in April and end in November with no construction during the winter season. Bridge removal and replacement, based upon an April to November construction season, stringent water quality standards, and the existing traffic situation, would require about 1.5 years for each bridge. The estimated total construction time would be six years.

f. Description of Disposal Method. - The fill would be discharged by land based draglines, front end loaders, and dump trucks.

II. Factual Determinations

a. Physical Substrate Determinations.

(1) Substrate Elevation and Slope. - Changes in substrate elevation and slope are summarized below:

- Vertical floodwalls along the north bank and south bank would vary from 2 to 6 feet above the ground. Floodwalls at Edison Way Industrial Park would vary between 5 to 7 feet above ground.
- Levees at the Edison Way Industrial Park and along Steamboat Creek and Boynton Slough would average 8 feet and 12 feet above the ground, respectively. Slopes would vary from 1V to 2H on the landward side to 1V to 3H on waterward side. Levees along North Truckee Drain would average 6 to 8 feet above the ground.

- The North Truckee Ditch Diversion structure and Wingfield Diversion structure would be reconstructed; North Truckee realigned upstream and Wingfield in the same place.
- The detention basin inlet weir would be constructed with a crest elevation equivalent to a Truckee River discharge of 10,500 cfs.
- A 15 inch layer of rock would be placed on the exposed slopes of all the excavated channels.
- A 12 inch layer of rock would protect the north and east water side banks of the detention basin levee and inlet weir.

(2) Sediment Type. - The sediment type within the study area is composed of predominantly sand with some gravel, silts, and clays. This sediment would be covered with embankment material, concrete, stone, and cobbles.

(3) Fill Material Movement. - The nature of the material would preclude movement within the watercourse.

(4) Physical Effects on Benthos. - Benthic communities at the discharge sites would be covered during construction; thus, temporarily reducing species diversity and abundance. Recolonization would be rapid since the nature of the sediment and hydrology of the affected area would be essentially unchanged. However, recolonization would not occur where permanent structures are placed. This effect would be somewhat reduced by the establishment of sessile species on the hard substrate.

(5) Other Impacts. - No other significant adverse impacts to the physical substrate were identified.

(6) Action Taken to Minimize Impacts. - Flow diversion structures, silt screens, and timing of construction during low flows would minimize the impacts of turbidity and suspended solids. Other actions include aligning the levees to avoid vegetation where possible and replanting riparian vegetation as mitigation for riparian and emergent vegetation losses.

b. Water Circulation, Fluctuation, and Salinity Determinations.

(1) Water.

(a) Salinity. - Not applicable.

(b) Water Chemistry. - The discharge would not result in an appreciable chemical change because of the inert nature of the fill material.

(c) Clarity. - Minor and localized reduction would occur during construction.

(d) Color. - Slightly modified during construction.

(e) Odor. - No significant adverse effect.

(f) Taste. - No significant adverse effect.

(g) Dissolved Gas Levels. - Localized modification to dissolved gas levels would occur during construction.

(h) Nutrient Levels. - The nature of the fill material would preclude any significant change in the nutrient cycle or food supply.

(i) Eutrophication. - Eutrophication modifications would be negligible.

(j) Other as Appropriate. - No other significant adverse impacts to water parameters are anticipated.

(2) Current Patterns and Circulation.

(a) Current Patterns and Flow. - The reconstruction of the North Truckee Ditch upstream of its existing location, reconstruction in place of the Wingfield Park Diversion, new bridge piers, and the inlet weir structure for the detention basin would have minimal effect on current patterns.

(b) Velocity. - The fill would cause a negligible change in velocity.

(c) Stratification. - No impact.

(d) Hydrological Regime. - Refer to Paragraph II. b.(2)(a).

(3) Normal Water Level Fluctuations. - The inlet weir to the detention basin will cause water levels to be higher in the detention basin but this storage of flood water would keep downstream flows to existing levels.

(4) Salinity. - Not applicable.

(5) Actions That Will Be Taken to Minimize Impacts. - Refer to Paragraph II a(6).

c. Suspended Particulate/Turbidity Determinations.

(1) Expected Changes in Suspended Particulates and Turbidity Levels In Vicinity of Disposal Site. - Turbidity levels are expected to increase in and downstream of the study area during construction. However, this effect would be minimized by the turbidity controls discussed in Paragraph II a.(6).

(2) Effects (degree and duration) on chemical and physical properties of the water column. -

(a) Light Penetration. - Localized short-term reductions in light penetration would occur during construction.

(b) Dissolved Oxygen. - Localized short-term reduction in dissolved oxygen would occur during construction.

(c) Toxic Metals and Organics. - Toxic metals or organics are not known to exist in concentrations sufficient enough to adversely affect the physical properties of the water column.

(d) Pathogens. - The discharge would have no effect on pathogenic levels.

(e) Esthetics. - The effects of the discharge may be viewed as esthetically displeasing by some observers.

(3) Effects on Biota.

(a) Primary Production, Photosyntheses. - Localized reductions would occur in the project area during construction.

(b) Suspension Filter Feeders. - The localized increase in turbidity and suspended particulates during construction would have a short-term adverse impact on filter feeders.

(c) Sight Feeders. - The localized increase in turbidity and suspended particulates during construction would have a short-term adverse impact on sight feeders.

(4) Actions Taken To Minimize Impacts. - Refer to Paragraph II a.(6).

d. Contaminant Determinations. - The borrow material from the Mira Loma Borrow Pit is predominantly sand and free of contaminants. The other fill material (concrete, quarry stone, commercial sand, and streambed cobbles) by nature do not possess an affinity for contaminants. Thus, the possibility of introducing, relocating, or increasing contaminants is remote.

e. Aquatic Ecosystem and Organism Determinations.

(1) Effects on Plankton. - Since the discharge would not cause significant changes in biological and physical parameters, the effect of the discharge on plankton would be temporary and insignificant.

(2) Effects on Benthos. - Refer to Paragraph II a.(4).

(3) Effects on Nekton. - The discharge would have a short-term, insignificant adverse effect on fish and their habitat. A detailed discussion of these impacts is included in Section 5.2 in the EIS.

(4) Effects on Aquatic Food Web. - The fill activities would have short-term and localized effects on the food chain. However, the measures discussed in Paragraph II a.(6) would reduce these impacts.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. - None are located within the study area.

(b) Wetlands. - Approximately 2.6 acres of wetlands would be lost to the construction of the levees along Boynton Slough. This loss would be mitigated by the planting of 2.6 acres of riparian vegetation along Steamboat Creek as recommended by the Fish and Wildlife Service.

(c) Mudflats. - No mudflats within the discharge sites would be impacted.

(d) Vegetated Shallows. - None would be impacted by the discharge.

(e) Coral Reefs. - None occur in the study area.

(f) Riffle and Pool Complexes. - The discharge would have no significant adverse impact on the riffle and pool characteristics of the Truckee River.

(6) Threatened and Endangered Species. - The discharge would have no significant effect on the endangered cui-ui since its habitat is downstream of Derby Dam and the turbidity from the discharge will be controlled within the project area to State standards. The threatened Lahontan cutthroat trout which occurs within the study area would experience minor, temporary adverse habitat changes due to the turbidity and construction equipment activity. Total impacts from loss of riparian vegetation include adverse water temperature increases which could affect both fish. Formal consultation was completed with the Office of Endangered Species. Measures to mitigate and enhance these species have been incorporated into the project.

(7) Other Wildlife. - Wetland habitat losses would effect a decrease in birds and mammals until revegetation occurs. However, this loss would be mitigated by the proposed mitigation and enhancement plantings and result in an increase in wildlife abundance and diversity. Maintenance of the detention basin in permanent agriculture and acquisition of Steamboat Marsh would preserve and enhance wildlife values.

(8) Actions to Minimize Impacts. - In addition to the actions discussed in Paragraph II a.(6), fish ladders would be employed to minimize impacts.

f. Proposed Disposal Site Determinations.

(1) Mixing Zone Determinations. - None required because of the nature of the discharge material.

(2) Determination of Compliance with Applicable Water Quality Standards. - Review of Federal, State, and local water quality standards indicate that because of the nature of the material, methods of discharges, and timing of disposal, the activity will comply with applicable standards.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supply. - No significant adverse impact.

(b) Recreational and Commercial Fisheries. - Recreational fishing may decrease during ongoing construction. However, recreational opportunities including fishing should increase substantially with completion of the project.

(c) Water Related Recreation. - Short-term adverse impacts to water related recreation could occur during construction.

(d) Esthetics. - Construction activities could be viewed as esthetically displeasing by some observers.

(e) Parks, National and Historical Monuments, National Seashore, Wilderness Areas, Research Sites, and Similar Preserves. - The Virginia Street Bridge is on the National Register of Historic Places. Coordination will continue with the State Historic Preservation Office concerning replacement of the bridge.

g. Determination of Cumulative Effects on the Aquatic Ecosystem. - The discharge would not have a cumulative adverse impact on the aquatic ecosystem.

h. Determination of Secondary Effects on the Aquatic Ecosystem. - Secondary effects on the aquatic ecosystem have been considered and none were identified.

Finding of Compliance
for
Truckee Meadows Investigation
(Reno - Sparks Metropolitan Area) Nevada

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. Levees setback entirely above the ordinary high waterline were considered as alternative disposal areas but were determined impracticable because of real estate constraints in the downtown area. Upstream reservoirs and various bypass tunnels were eliminated because of social, economic, and environmental considerations. The EIS considered the following alternatives in detail: No Action and Channel-Levee Plan with Detention Basin. The alternatives are discussed in detail in the EIS.

3. The discharge would not violate any applicable State Water Quality Standards or the Toxic Effluent Standards of Section 307 of the Clean Water Act.

4. The proposed discharge of the Selected Plan is in full compliance with the Endangered Species Act. FWS has advised there are two listed species occurring in the study area. A biological data report and a biological assessment were completed. Formal consultation has been completed and FWS determined there would be no jeopardy to the listed fish with construction of the Selected Plan.

5. The proposed disposal of dredged material will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife will not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values will not occur.

6. Appropriate steps to minimize potential adverse impacts of the discharge include flow diversion structures, silt screens, timing of construction during low flow, and habitat mitigation.

7. On the basis of the guidelines the proposed disposal sites for the discharge of dredged material are specified as complying with the inclusion of appropriate and practical measures to minimize pollution or adverse effects to the aquatic ecosystem.

8. Statement of Compliance. - On the basis of the guidelines, the proposed disposal sites for the discharge of fill material is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical measures to minimize pollution or adverse effects to the affected aquatic ecosystems.

Arthur E. Williams

ARTHUR E. WILLIAMS
Colonel, CE
District Engineer

Attachment 3

U.S. Fish and Wildlife Service Coordination Act Report

UNITED STATES DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE

FISH AND WILDLIFE COORDINATION ACT REPORT

TRUCKEE MEADOWS INVESTIGATION (RENO-SPARKS METROPOLITAN AREA), NEVADA

REGION ONE

APRIL 1984

SERVICE POSITION

The Truckee Meadows Investigation (Reno-Sparks Metropolitan Area), Nevada is a feasibility study to provide protection from a 100 year flood event. This is a refinement of the most acceptable of a series of alternatives evaluated in 1980. Major features include; floodwalls, setback floodwalls, setback levees, bridge elevation, minor channel excavation, a regulated detention area and an overflow area. The major resource impact would be removal of 31 acres of palustrine forested and scrub-shrub wetlands, commonly known as riparian habitat. This resource is important to migratory birds, local recreation, and most importantly populations including resident salmonids, threatened Lahontan cutthroat trout and endangered cui-ui. Water temperature control is the link between riparian vegetation removal and the listed fishes in the lower Truckee River. Accordingly, riparian revegetation is the primary mitigation recommendation. The removal of abandoned dams or upgrading of associated fish ladders is also recommended. As enhancement for migratory birds, resident salmonids and listed fish a 300 acre wetlands/nutrient trap and 8,770 feet of riparian plantings are recommended within the proposed overflow area. In addition, placement of large boulders in the Truckee River channel has been identified as a fishery enhancement feature and selected irrigation diversions have been identified for reconstruction to accept fish screens at a later date. The Corps and, as necessary, the City of Reno and Washoe County have given tentative concurrence to these recommendations. The Service actively supports the project as proposed.

STATE OF NEVADA
DEPARTMENT OF WILDLIFE
1100 Valley Road
P.O. Box 10678
Reno, Nevada 89520-0022
(702) 789-0500

RICHARD H. BRYAN
Governor

WILLIAM A. MOLINI
Director

April 4, 1984

Mr. Donald J. King
Project Leader
U.S. Fish and Wildlife Service
4600 Kietzke Lane, Bldg. "C"
Reno, NV 89502

Dear Don:

We appreciate the opportunity to review and provide comment on the Draft Fish and Wildlife Coordination Act Report for the Truckee Meadows Investigation which was prepared for the U.S. Army Corps of Engineers by Chet Buchanan and Bob Hallock. The report is well written and appears to address the major concerns of our agency with respect to the potential impacts of the proposed project on the fish and wildlife resources in the area. We look forward to continued cooperation between our respective agencies as a means of insuring the protection of our natural resources.

If you have any questions on the above or feel a need for further input at this time, please advise.

Sincerely,

William A. Molini
Director

RPM:pw

cc: Region I

FISH AND WILDLIFE COORDINATION ACT REPORT

Truckee Meadows

Investigation (Reno-Sparks

Metropolitan Area), Nevada

Prepared for the

U.S. Army, Corps of Engineers

Sacramento District

by

U.S. Fish and Wildlife Service

Division of Ecological Services

Reno, Nevada

Donald J. King, Complex Manager

Robert J. Hallock, Fish and Wildlife Biologist

Chester C. Buchanan, Fishery Biologist

Released by

U.S. Fish and Wildlife Service

Great Basin Complex

Reno, Nevada

PREFACE

This is a report by the Fish and Wildlife Service (Service) on the Truckee Meadows Investigation (Reno Sparks Metropolitan Area), Nevada. It is a detailed report of the impacts on fish and wildlife associated with the proposed construction of flood control measures in and along the Truckee River and its major tributaries through the Reno-Sparks-Truckee Meadows Area, Washoe County, Nevada. This report has been prepared under the authority of the Fish and Wildlife Coordination Act, P.L. 85-624 Section 2(b) and is in keeping with the spirit and intent of the National Environmental Policy Act. This report has the endorsement of the Nevada Department of Wildlife.

The Truckee Meadows Investigation feasibility report is being prepared by the Army Corps of Engineers (Corps) in response to a February 7, 1964 resolution by the Committee on Public Works of the United States Senate. The Service has been consulted throughout the planning process and has had input in selecting the recommended alternative considered in this document.

The Service evaluated the resources and project impacts based on local and regional habitat scarcity, vulnerability to changes, replaceability through management actions, habitat quality, feasibility for compensating unavoidable resource losses, and a project life of 50 years (1990-2040). The goals of the Service in this study are: (1) to evaluate the impact of the proposed plan on fish and wildlife populations, their habitat and their utilization by the public throughout the entire planning area, (2) to recommend methods of mitigating unavoidable fish and wildlife habitat losses, (3) to recommend methods of enhancing fish and wildlife habitat where feasible.

The Service's findings are based on project descriptions and data provided by Project Engineer, Allan Oto, through April 5, 1983. This report supersedes our prior input on this project.

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DESCRIPTION OF THE PLANNING AREA

The Truckee River Basin, encompassing an area of approximately 3,100 square miles, is situated in northeastern California and western Nevada. Above Vista (east of Sparks, Nevada) the river drains about 1,430 square miles of mountainous terrain, including about 500 square miles above the Lake Tahoe outlet. The Truckee River originates at the northwestern shore of Lake Tahoe. Flowing north from there through the community of Truckee, California, and then east down the eastern slope of the Sierra Nevada, the river enters the semi-arid valley floor and traverses the rapidly expanding Reno-Sparks metropolitan area and Truckee Meadows on its way to its terminus at Pyramid Lake, a distance of about 110 miles (Figure 1). The river is characterized by steep gradients in its upper reaches. From Reno to Pyramid Lake, the gradient is reduced.

Major tributaries to the Truckee include the Little Truckee River, and Donner, Martis, Prosser, Bronco, Gray, and Steamboat Creeks. Numerous perennial and intermittent tributaries along the river contribute to flood flows during periods of rain and snowmelt. Runoff in the basin is partially controlled by Lake Tahoe, Boca, Stampede, Martis Creek and Prosser Creek Reservoirs. Several power plants and many water diversion structures on the mainstem upstream of the Steamboat Creek confluence also regulate streamflow.

The project would directly impact large portions of the Truckee River between Vista and Twin Lakes Drive, a distance of over 10.5 river miles. Through this reach the river typically discharges between 200 and 1,000 cfs through a gravel and boulder lined channel. With the exception of the "up town" Reno area, the configuration of the river approximates what is believed to have existed prior to development. The channel thalweg is believed to be lower in elevation in the "up town" area because flow has been constricted for at least 75 years. Also the City of Reno may have excavated part of this area. Similarly the channel is lower in elevation in the Vista area. A Corps project lowered the Vista reef, a natural rock sill serving as a hydraulic control at the east edge of Truckee Meadows. These characteristics and water quality have always supported a cold water fishery above the confluence of Steamboat Creek in the Truckee River.

Native wetland vegetation along the river banks has been reduced in many areas throughout the project area. Losses were initially associated with agricultural activities and mining. Recently, more permanent losses have been caused by flood walls, buildings, parking lots, and bridges encroaching upon the river banks. A strip of vegetation remains along both banks of the Truckee River through most of the study area.

Truckee Meadows, a poorly drained valley about 10 miles in width and 16 miles long, is located between the Sierra Nevada on the west and the Virginia and Pah Pah Range on the east, and it lies immediately east and south of the Reno-Sparks metropolitan area. Although periodic flooding occurs, the Truckee Meadows area is undergoing a rapid transition from agricultural to urban-industrial use. Especially within the last few years, a drastic land-use change has occurred. Today, the area is dominated by warehouses, commercial activity, and homes.

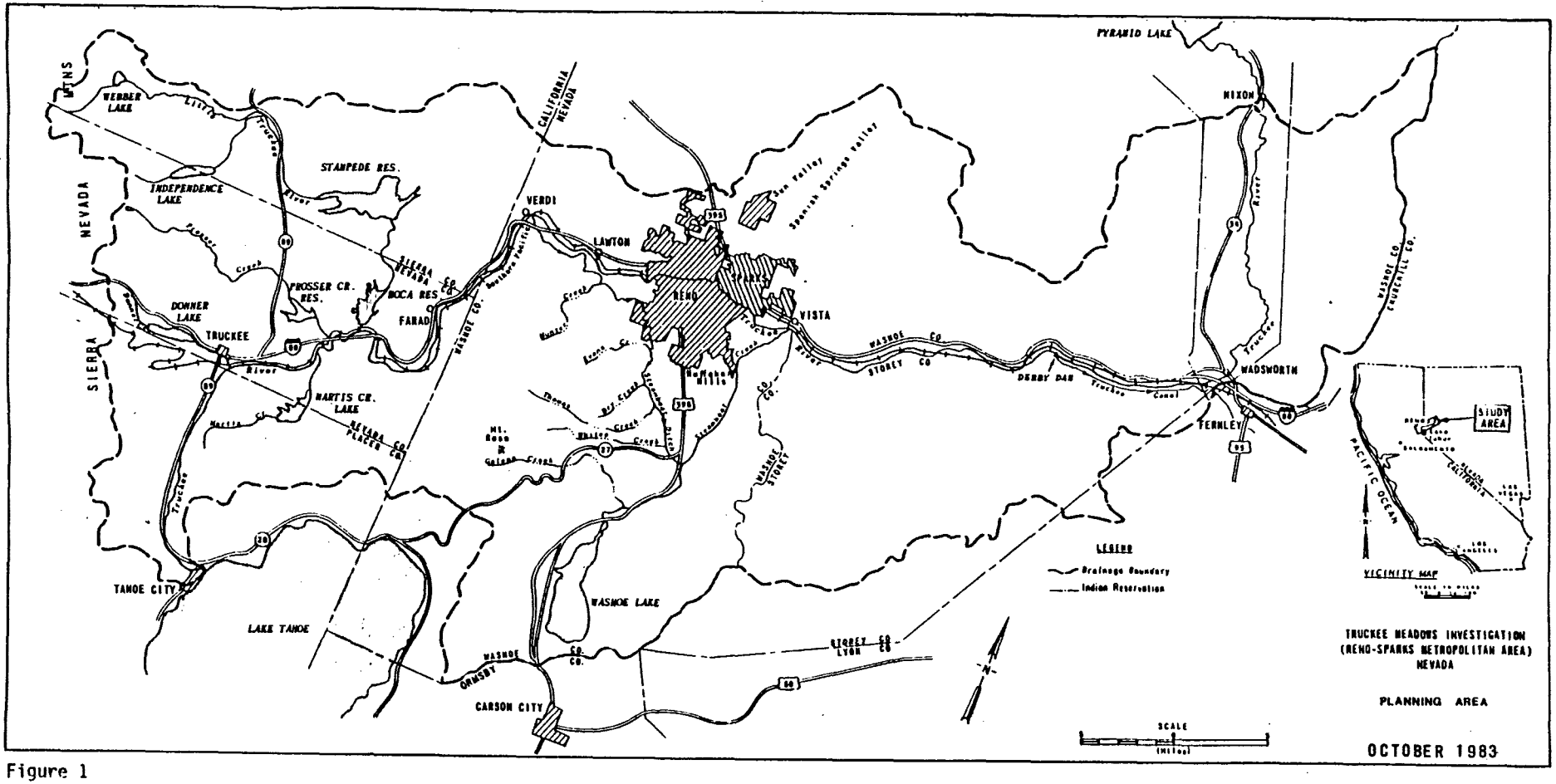
PYRAMID LAKE
NIXON
WEBBER LAKE
INDEPENDENCE LAKE
STAMPEDE RES.
CALIFORNIA
NEVADA
VERDI
LAWTON
RENO
SPARKS
VISTA
SIERRA NEVADA
DONNER LAKE
TRUCKEE
PROSSER CR. RES.
BOCA RES.
FARAD
HARTIS CR. LAKE
NEVADA PLACER CO.
WASHOE CO.
STOREY CO
DERBY DAM
WADSWORTH
FERNLEY
TAHOE CITY
LAKE TAHOE
WASHOE LAKE
WASHOE STOREY
LYON CO
CARSON CITY
LEGEND
Drainage Boundary
Indian Reservation
SCALE
STUDY AREA
PACIFIC OCEAN
VICINITY MAP
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
PLANNING AREA
OCTOBER 1983

Figure 1

Steamboat Creek, the only major tributary entering the Truckee River within the project area, originates at Washoe Lake approximately 15 miles south of Reno. Draining the southern and eastern section of the Truckee Meadows, Steamboat Creek flows through the predominantly agricultural area to its confluence with the Truckee River near Vista. Several large urban areas also drain into Steamboat Creek. There is a series of irrigation and municipal water diversion structures. Many of these will be abandoned as urbanization of the valley is completed. "Steamboat Wetland" is located on the northern portion of Steamboat Creek, which is west of Hidden Valley and within the project area.

DESCRIPTION OF THE PROJECT

For this analysis we are using illustrations, information and verbal descriptions of the proposed project recieved from the Corps prior to April 5, 1983. The proposed project is similar to the National Economic Development Plan outlined by the Corps in their 1980 Information Summary (2). The project presently being proposed includes a wide array of structural approaches for passing up to 18,500 cubic feet per second of water (a 100-year flood event) through Truckee Meadows without property damage. A storage area is also included within the project to prevent additional flood intensity in downstream areas. The period of analysis is 50 years (1990 through 2040).

Flood protection would be provided primarily through bridge replacements, setback floodwalls, floodwalls, setback levees, channel excavation in four isolated areas, and an overflow water retention area (Figure 2). The following is a detailed description of these proposed structural features beginning at the western or upstream end of the project area and proceeding downstream to the Vista area; then continuing up the Steamboat Creek drainage through the University of Nevada Farms south of the Truckee River for about two miles:

1. Floodwalls and setback floodwalls, 2 to 6 feet above ground would be constructed or reconstructed along the north bank between Booth Street and Lake Street, and between Washington Street and Lake Street on the south bank, a distance of 7,230 feet.

2. Bridges would be reconstructed and replaced at grade at Arlington Avenue, Booth, Virginia, and Center Streets. Lake and Sierra Streets will be reconstructed and replaced slightly above existing grade. The foot bridges at Wingfield Park would also be elevated.

3. Channel excavation is proposed along the north bank in the vicinity of Booth Street Bridge, and excavation would also take place within the stream channel to a maximum depth of 1.5 feet from just above Arlington Avenue bridge to just above Sierra Street Bridge. The total river distance involved is approximately 1,600 feet.

4. From Kietzke Lane to Glendale Avenue 2,775 feet of setback levees 3.5 feet high are planned for the south bank only.

5. The North Truckee Drain diversion dam just above Glendale Avenue would be reconstructed and realigned.

6. Between Glendale Avenue and South Rock Boulevard there would be 4,575 feet of setback floodwall and 5,590 feet of setback levee. These structures would range from 2.5 to 7 feet high.

7. Between South Rock Boulevard and South McCarran Boulevard there would be 5,785 feet of setback floodwall, 1,600 feet of floodwall at the river's edge, and 4,870 feet of setback levee. These structures would typically vary between 5 and 7 feet high.

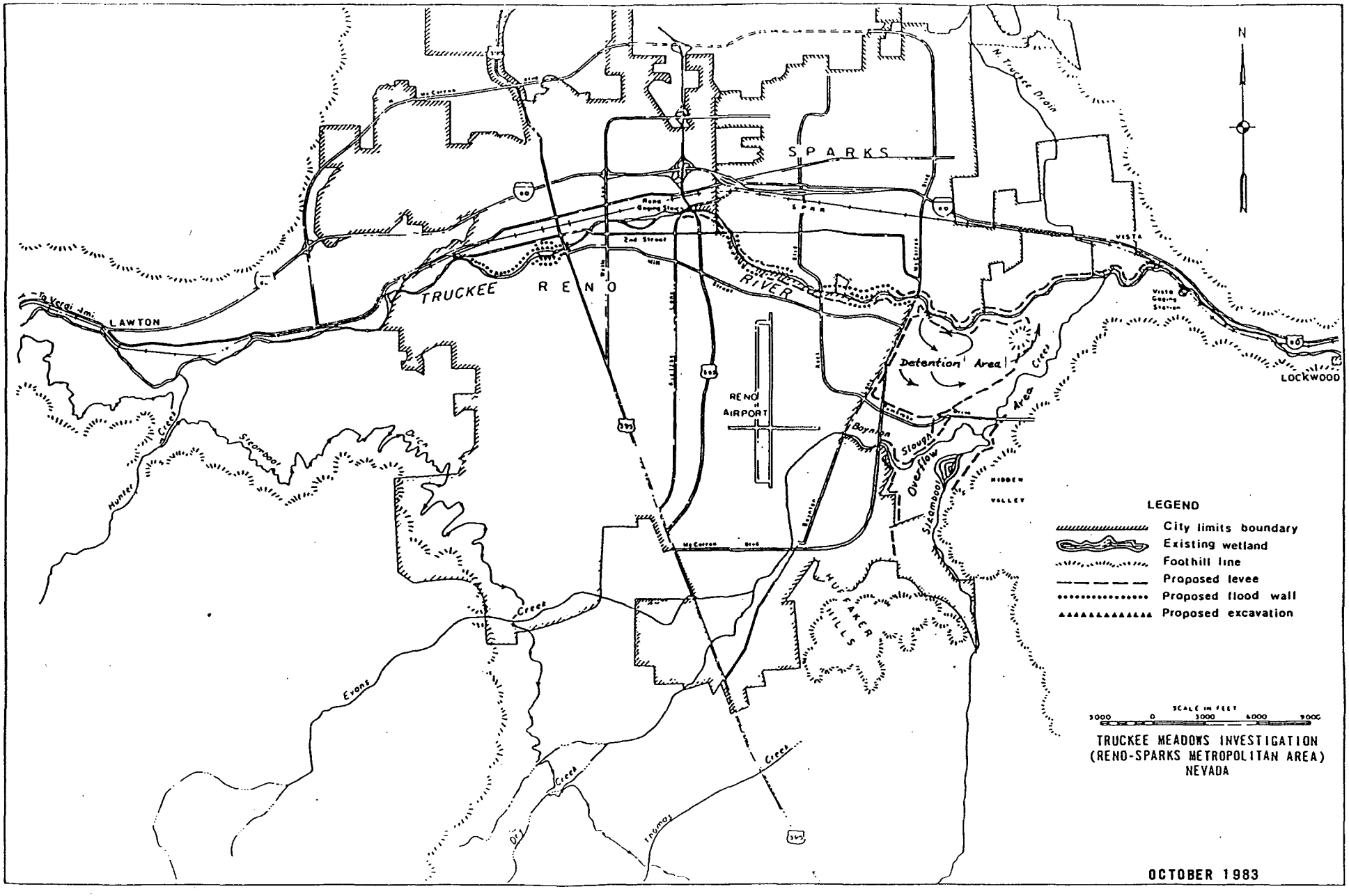
N
SPARKS
TRUCKEE
R E N O
RIVER
LAWTON
RENO
AIRPORT
Detention Area
Creek
Area
LOCKWOOD
Boynton
Slough
Overflow
Steamboat
Creek
Hunter
Creek
Evans
Creek
Creek
Creek
Dry
Creek
Truckee
Drain
HIDDEN
VALLEY
HUFFAKER
HILLS
LEGEND
City limits boundary
Existing wetland
Foothill line
Proposed levee
Proposed flood wall
Proposed excavation
SCALE IN FEET
3000 0 3000 6000 9000
TRUCKEE MEADOWS INVESTIGATION
(RENO-SPARKS METROPOLITAN AREA)
NEVADA
OCTOBER 1983

Figure 2

8. In the area of Glendale Park 5.6 acres along the north bank would be excavated to the surface elevation of the Truckee River with 1,000 cfs of discharge.

9. Between South McCarran Boulevard and the east end of the project at Vista a total of 22,575 feet of setback levees would be built on both sides of the river. These levees would be approximately 11 feet high and 82 to 90 feet wide at the base.

10. Immediately east of the University Farm's building on South McCarran Boulevard a 700 foot overflow weir would be built and approximately 7 acres excavated from the south bank of the Truckee River adjacent to agricultural land. Excavation would be down to surface elevation of the Truckee River with 1,000 cfs discharge.

11. The University Farms area would be surrounded by 10 foot levees and serve as an overflow area to temporarily store peak flows of floods greater than a 50-year event. This is intended to prevent increased flood peaks for areas downstream of the project. Approximately 18,700 feet of levee would be built south of the Truckee River surrounding the University Farms to form this feature. An overflow weir and low level outlet structure would be located along the east side levee to release flows into the Truckee River.

12. Levees with an average height of 10.5 feet would be constructed along Steamboat Creek and Boynton Slough. A total distance of 18,400 feet is involved. Pembroke Drive bridge over Steamboat Creek would be raised and lengthened to accommodate greater flows.

13. Material and spoil disposal sites are undefined. However, we are told upland sites would be proposed.

BIOLOGICAL AND SOCIO-ECONOMIC EVALUATIONS

Our analysis of wildlife habitats throughout the project area is based largely on information provided by the Nevada Department of Wildlife (NDOW) and that which we have collected in the past. Additional field data were acquired on the extent of habitat alteration with emphasis placed on wetlands. Where possible, data representing average annual values for the life of the project, 1990-2040, are presented.

Aquatic and terrestrial resources, without and with the project are described for the entire planning area. Emphasis was placed on areas of major impact such as wetland habitat and aquatic resources in the Truckee River. Also, socio-economic impacts resulting from estimated changes in fish and wildlife resources were evaluated for selected portions of the project.

An adequate listing of the flora and fauna present in the study area has already been compiled from numerous sources by the Corps in the Alternatives Environmental Working Paper (1). A similar series of listings may be found in Truckee Meadows Engineers Inc. (22) and in Washoe Council of Governments (29). The Service provided similar lists to the Corps in a planning aid letter of October 16, 1979.

Our analysis of terrestrial resources has been confined to a survey of wetland wildlife habitats likely be impacted by the project. Since relative abundance of species or groups in the above cited species lists is generally unavailable for the wetland habitat types involved in this proposed project, we will confine our discussion to wetland acreages.

Upland terrestrial habitats which may be impacted by the project are not being evaluated here because we assume that wildlife use on the majority of these areas will be similar with or without the project.

1. Future Without The Project

In this section we will:

1. Describe the existing aquatic and terrestrial resources;
2. Discuss the significance of important species and groups which may be impacted by the project;
3. Describe the human use of the aquatic and terrestrial uses; and
4. Project the above conditions to provide average annual estimates for the period 1990-2040 where possible.

a. Aquatic Resources

Habitat

The U.S. Environmental Protection Agency classified the Truckee River within the Truckee Meadows (in addition to that further upstream) as Value Class I; the highest valued fishery resource. Summer water temperatures for this section of

the river vary between 50°F and 68°F while winter water temperatures vary between 32°F and 50°F. Dissolved oxygen concentrations during the summer average about 6-7 mg/l while those during the winter are higher; usually between 8 and 11 mg/l. The average stream gradient within Truckee Meadows is 6.3 yards per mile. The stream channel is a granite base ranging in width from 18.5 yds. to 41.5 yds. (average of 29.4 yds.) and depths during summer ranging from .01 yds. to 3.3 yds. The bottom substrate varies from sand to boulders with the composition frequency varying greatly between areas. Fines (less than .03 inches in diameter) represent between 16% and 19% of the gravel bed. The pool-riffle ratio is approximately 1:4. Riparian vegetation, undercut banks, and boulders (greater than 2 feet in diameter) provide protective areas for fish and shade for reducing the rate at which solar radiation increases water temperatures (17, 22, 24, and 27). Riparian vegetation is discussed in more detail in the following Terrestrial Resources section.

The stream flow pattern has been altered over the last 80 years by man's activities. Water storage and diversions have greatly changed the natural flow pattern which was typically low in fall and high in winter or spring, followed by a gradual decline in summer and fall. Today, peak flows still occur in the winter or spring but are usually reduced by the large amount of water held in storage. The highest sustained flows above Derby Dam usually occur in the summer when irrigation demands are highest. Below Derby Dam the river is nearly dry on some occasions during the summer and fall.

Fish Resources

The Truckee River and its tributaries support a diverse assemblage of game and nongame fishes including: rainbow, brown and brook trout; mountain and Tahoe suckers; mountain whitefish, largemouth bass, bluegill, green sunfish, black crappie, Sacramento perch, yellow perch, tui chub, Lahontan redside, Lahontan speckled dace, carp, Paiute sculpin, the threatened Lahontan cutthroat trout, and the endangered cui-ui (Table 1) (27). The river flowing through the lower portion of the Truckee Meadows is the transition area between coldwater and warmwater fish species during a drought year (Table 2). This transition area varies seasonally, but it is usually found downstream of Steamboat Creek during normal water years. The predominate fish species in the Reno/Sparks area (which is above the transition area) are mountain whitefish, Tahoe suckers, mountain suckers, rainbow trout, and brown trout (Table 2). Degraded water quality downstream of Steamboat Creek inhibits coldwater fishes from using the river during late summer and fall. This is caused primarily by the cumulative effect of solar radiation and inflow of poor quality water from Steamboat Creek (agricultural returns, sewer effluent, and storm runoff). Warmwater fishes such as Lahontan redsides, carp, and Tahoe suckers are the primary occupants of this area.

Extreme low flows associated with drought conditions create higher water temperatures than normal, thereby moving the transition zone from below Steamboat Creek to as far upstream as the Kietzke Lane bridge. This will drive coldwater fishes upstream and allow the immigration of warmwater fishes, which are of marginal interest to sport anglers. This condition occurred during August 1977 and its impact on fish populations was documented by the

Table 1. Fishes taken during U.S. Fish and Wildlife population sampling of the Truckee River; June - October, 1977. An asterisk is placed alongside of species native to the Truckee River.

SCIENTIFIC NAME	COMMON NAME
Salmo trutta	Brown trout
Salmo gairdneri	Rainbow trout
*Salmo clarki henshawi	Lahontan cutthroat trout
*Prosopium williamsoni	Mountain whitefish
*Catostomus tahoensis	Tahoe sucker
*Catostomus platyrhynchus	Mountain sucker
*Richardsonius egregius	Lahontan redside
*Rhinichthys osculus	Lahontan speckled dace
*Gila bicolor	Tui chub
Cyprinus carpio	Carp
Perca flavescens	Yellow perch
Micropterus salmoides	Largemouth bass
Lepomis cyanellus	Green sunfish
Lepomis macrochirus	Blue gill
Pomoxis nigromaculatus	Black crappie
Gambusia affinis	Mosquito fish
*Cottus beldingi	Paiute sculpin

Table 2. Number of fish per acre, by species, in the Truckee River - Reno/Sparks metropolitan area (survey by the USFWS, summer, 1977)

General Vicinty	Rainbow trout	Lahontan cutthroat trout	Brown trout	Mountain whitefish	Tahoe sucker	Mt. sucker	Lahontan redside	Green sunfish	Black Crappie	Large-mouth bass	Speckled dace	Carp
Vista Ave. to UNR farms	0	0	10.6	159.7	487.5	517.5	47.1	0	0	0	3.3	9.8
UNR Farms to Kietzke Lane	0	.7	27.0	56.0	287.7	154.7	161.8	.7	0	26.3	7.5	8.9
Kietzke Lane to Idlewild Park	9.9	.8	116.9	402.4	2622.2	402.3	254.0	7.2	1.6	0	0	0
Idlewild Park to Ivan Sack Park	21.0	2.7	121.7	1502.6	371.5	723.3	0	1.3	0	0	0	0
Ivan Sack Park to S. McCarran Blvd.	17.7	1.5	81.0	1056.4	89.4	157.9	1.3	1.3	0	0	0	0
S. McCarran Blvd. to Ambrose Park	20.6	.8	149.1	653.3	6.2	6.7	0	0	0	0	0	0
Ambrose Park to Hunter Creek	49.6	0	159.0	1698.4	58.5	0	0	0	0	0	0	0

Service (Table 2).[1/] The optimum water temperature for rainbow trout, according to Bell (4), ranges between 54°F and 66°F, with avoidance behavior occurring at or near 71°F. The average water temperature at the McCarran Bridge during August 1976 was 64.4°F, which is within the optimum range, while the average (estimated) water temperature for August 1977 in the same location was 70.6°F, well above the optimum temperature and near avoidance temperature. The density of carp, speckled dace, largemouth bass, black crappie, and green sunfish, which is near zero during normal water years, increased to about 12 fish per acre during the drought. The salmonid population in the same area, whose density during normal water years is about 243 fish per acre, decreased to about 32 fish per acre.

Under normal water conditions, the river within the metropolitan area (Hunter Creek to Steamboat Creek) can support nearly 150,000 salmonids through natural reproduction; 23.8 rainbow trout per acre; 120.7 brown trout per acre; and 1062.6 mountain whitefish per acre (Table 3). These figures do not represent those reared in hatcheries and stocked in the river for immediate harvest. During drought conditions, the carrying capacity and natural production potential of the same river area is reduced to 16.9 rainbow trout per acre, 91.5 brown trout per acre, and 789.8 mountain whitefish per acre.

Salmonids historically spawned in the entire Truckee River. Today high water temperatures, passage barriers, poor water quality, water diversion, and low intergravel dissolved oxygen concentrations frequently prevent successful reproduction of salmonids in the lower Truckee River. The river throughout the Meadows provides scattered spawning sites for salmonids. The area immediately below Ivan Sack Dam provides a large area of good spawning habitat and is frequently used by mountain whitefish and brown trout. Brown trout and mountain whitefish, the only salmonids that spawn in significant numbers in the Truckee Meadows, spawn during September through December, their progeny emerging from the gravel in early spring. The rainbow trout population is primarily maintained by a Nevada Department of Wildlife stocking program.

The threatened Lahontan cutthroat trout was once an abundant and widespread inhabitant of the Truckee River Basin. Only a remnant of this population remains today in the river's headwater. The Pyramid Lake strain (or stock) became extinct in the 1940's. The historic Pyramid Lake fishery has been

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1/ The Service estimated the population density of fishes in the river in the summer of 1977 (26). Since this was a drought water year and extremely low river flows caused the transitional area to move upstream, density estimates of coldwater fishes downstream of the Kietzke Lane bridge as given in Table 2 are not typical of normal water years. Density estimates from upstream of the bridge are probably representative of what should have occurred downstream of the bridge in a normal water year. Therefore, we used these data to estimate fish population densities downstream of the bridge during normal water years. These estimates only refer to fish naturally produced in the river, it does not include fish that were stocked.

Table 3. Estimated number of salmonids in the Truckee River, Nevada (Reno/Sparks metropolitan area) during a normal water year without the project

Species	Fish[1] per Acre	Available[2] Habitat (Acres)	Estimated[3] No. of fish
Rainbow Trout	23.8	122.98	2,927
Brown Trout	120.7	122.98	14,844
Mountain Whitefish	1,062.6	122.98	130,679
	Total no. of fish		148,450

(1) Used relative abundance estimates by species (USFWS data, summer, 1977) for river area between Hunter Creek and Kietzke Lane

(2) Between Hunter Creek and Steamboat Creek

(3) These estimates only refer to fish naturally produced in the river, it does not include fish that were stocked

reestablished with the hatchery reared Summit Lake strain of Lahontan cutthroat trout. Efforts are now underway to reestablish spawning runs of this strain in the lower Truckee River. Once reestablished, these fish will probably begin their spawning run in February, increase through April and peak in mid-May. The run should be completed by the first half of June. These fish will require 56°F water or cooler for successful reproduction. Some of the offspring may remain in the river for two years before emigrating to the lake. During 1982 over 4,000 Lahontan cutthroat trout were stocked in the Truckee River by the Nevada Department of Wildlife. In 1983 the Service and the Pyramid Lake Paiute Tribe put over 1,000 Lahontan cutthroat spawners into the lower Truckee River. During 1982 and 1983 over 570,000 Lahontan cutthroat fingerlings were stocked in the lower Truckee River.

The endangered cui-ui, a lacustrine sucker endemic only to Pyramid Lake, enters the Truckee River each spring to spawn in the section between Pyramid Lake and Derby Dam. Around the first half of May the cui-ui spawning run begins its mass migration upstream. The adults return to the lake immediately after spawning. It requires about two weeks for the eggs to hatch and yolk-sac juveniles to emerge from the gravel, after which they are thought to move downstream to the lake. Dr. David Koch (personal communication) found that 57°F was the optimum temperature for incubating eggs and newly hatched juveniles under laboratory conditions. Recent efforts to restore the cui-ui include artificial propagation and stocking of Pyramid Lake, and construction of the Pyramid Lake Fishway to reestablish spawning runs in the Truckee River. Artificial propagation is considered a temporary restoration measure until natural reproduction can be fully reestablished in the lower river.

Fishery

The sport fishery in the Truckee River above Steamboat Creek is primarily for coldwater species. Fishing surveys by the Nevada Department Of Wildlife indicate that angling effort over the entire Truckee River within Nevada during the last ten years (1972-1981) has varied from a high of 226,851 angler-days in 1978 to a low of 121,297 angler-days in 1972 for an average of 162,361 angler-days per year. This reach of the Truckee River is the most popular stream fishery in Nevada and it is the third most popular fishery in Nevada behind Lakes Mead and Mohave (Jim Curran, NDOW, personal communication). Approximately 36% of these angler-days were expended within the Reno/Sparks area. The species composition of the sport harvest averages about 80-85% rainbow trout, 5-10% brown trout, and 5-10% mountain whitefish. Most of the rainbow trout (98%) and some of the brown trout (33%) are hatchery reared fish stocked by the NDOW. The Department's stocking program allocates annually about 30,000 lbs. of 8 to 10 inch rainbow trout and brown trout to the Truckee River within the State. Seventy-five percent of these fish (plus another 5 percent from downstream drift of upstream plants) are stocked within the Reno/Sparks city limits. Steamboat Creek and its tributaries in the Truckee Meadows provide an insignificant warmwater fishery.

During 1982 NDOW released 4,347 Lahontan cutthroat trout into the Truckee River (14). These were taken from the spawning run at Marlette Lake. Some of these fish are appearing in the catch within the project area. Cutthroat trout made up 10 percent of the catch above the project area in 1982.

Future Fish Resources and Fishery

The future of aquatic resources within the project area appears secure. We believe that the growing interest by the cities of Reno and Sparks in developing parks and green belts along the Truckee River and NDOW fishery management and environmental programs will preserve the river habitat and its aquatic resources in its present condition. Enhancement of this habitat is probable without the project. The Corps[2/], however, expects that the river channel within the study area will require periodic maintenance during the next fifty years. They estimate the river channel will require flood control maintenance at least twice and that some floodwalls and bridges may need replacement. Since these activities are not specifically described, we can only speculate as to their deleterious impact. Depending upon the construction techniques used, 16.3 acres of channel bottom and an acre of riparian vegetation may be disrupted. We assume, however, that the impact from these activities will be minimal since the construction will be with appropriate sediment control techniques in compliance with State standards for turbidity and the activities will occur only twice in fifty years. The Corps has estimated over the 50 year period of analysis there would be direct impact to 32 acres of channel bottom and another 54 acres of channel bottom would be impacted by siltation. The river should recover from the disruption and siltation of the channel bottom after the first spring flood. Therefore, we do not expect the abundance of salmonids naturally produced in the river to change significantly during the period of analysis, but to remain roughly at 150,000 fish with slight variations, especially after maintenance activities.

We estimated that from 1990 through 2040, the demand for angler-days on the Truckee River within Reno/Sparks will increase from 85,733 in 1990 to 105,053 in the year 2000, after which it will probably level off (Table 4). These estimates were based on the assumption that the relation of Washoe County population to angling effort on the Truckee River within Nevada in 1980 would continue through the year 2000, after which the demand for angler-days would remain nearly constant. A 10-year (1972-1981) average of angling effort was used to compensate for irregular variations among the years. By simply expanding future population estimates by this relation, we estimated future demand for angler-days. We obtained Washoe County population estimates for 1990 through 2040 from the Corps. Since about 36% of the angler-days on the Truckee River within Nevada are presently expended within the Reno/Sparks area, we conservatively multiplied 0.36 by the demand for angler-days in the Truckee River to estimate the demand for angler-days on the Truckee River within Reno/Sparks for the period of analysis.

The target harvest for the projected demand for angler-days is based upon NDOW target catch per unit of effort (CPUE) of 2.5 fish (salmonids) per

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2/ Letter of December 30, 1982 from George C. Weddell, Sacramento District Army Corps of Engineers to Donald J. King, Fish and Wildlife Service, Reno, Nevada.

Table 4. Numbers of native fish required to meet harvest demand from 1985 - 2040

Year	Population of Washoe County (1)	Demand for Angler-Days Truckee R. Stateline-Pyramid L. Res. (2)	Demand for Angler-Days Truckee R. Reno/Sparks (4)	Target Harvest (5)	Projected Stocking Rate of 9" fish (6) (lbs.)	Number Stocked (7)	Stocked Fish Harvested (8)	Harvest of Native Fish Required to Meet Target
1980	193,623	162,361 (3)	–	–	-	-	–	–
1985	243,600	204,268	73,536	183,842	30,000	117,000	93,600	90,242
1990	284,000	238,146	85,733	214,332	36,000	140,400	112,320	102,012
1995	316,000	264,979	95,392	238,480	42,000	163,800	131,040	107,440
2000	348,000	291,813 (9)	105,053 (9)	262,632 (9)	48,000 (9)	187,200 (9)	149,760 (9)	112,872 (9)
2040	616,520	291,813	105,053	262,632	48,000	187,200	149,760	112,872

(1) Data for years 1985-2000 from Univ. of Nevada, Reno and that for 2040 from the Army Corps of Engineers

(2) Assumption - Demand for angler-days will continue to increase proportionally with population

(3) Ten year average (1971-1980) - this figure was used to compensate for irregular variations among years

(4) 36% of total angler-days on Truckee River expended within Reno/Sparks (personal communication - Jim Curran, NDOW, Fallon, NV)

(5) (NDOW target CPUE of 2.5 fish per angler day) x (demand for angler days)

(6) NDOW allocated 30,000 lbs. in 1981 with maximum allocations of 60,000 lbs. in 2000; 75% of which are stocked in the Reno/Sparks area and another 5% drift down from the upstream plants

(7) 3.9 fish per pound

(8) 80% of hatchery fish will be harvested - Jim Curran, NDOW, Fallon, NV

(9) Demand will level off - Jim Curran, Fallon, NV

angler-day. It is obvious that the river within the cities cannot support a large enough population of naturally produced salmonids to meet this demand. Therefore, a stocking program of hatchery reared rainbow trout and brown trout is essential. Recently, NDOW allocated about 30,000 pounds of rainbow trout and brown trout to the Truckee River, 80% of which are stocked within the city limits and drift down from upstream plantings. By the year 2000, NDOW plans to stock 60,000 pounds of salmonids annually in the Truckee River. This poundage will probably continue through the year 2040. The difference between the number stocked and the target harvest will come from natural fish (Table 4). If we assume that the natural salmonid populations can withstand a 50% annual exploitation rate, the sustainable yield from the river within the cities is 75,000 salmonids annually (Table 4). With a target CPUE of 2.5 fish per angler-day, the natural salmonid population can support about 30,000 angler-days annually. It is apparent that enough natural salmonids are not available to satisfy the demand for angler-days in the future. The fact that is relevant to this report is that the entire sustainable yield of natural fish will be required throughout the period of analysis without the project.

b. Terrestrial Resources

Based on the assumption discussed under Biological and Socio-economic Evaluations above, we are indirectly approaching wildlife resources impact through wetland vegetation which may be impacted by the proposed project. Our discussions will focus primarily upon wetland/riparian vegetation along the banks of the Truckee River and Steamboat Wetland on Steamboat Creek west of Hidden Valley.

Truckee River Wetlands

Wetland vegetation along the Truckee River would be classified as palustrine forested and palustrine scrub-shrub under the National Wetland Inventory system (25). The most obvious components of this vegetation are Fremont cottonwood (Populus fremontii), black cottonwood (Populus trichocarpa), and Willow (Salix sp). Recently, exotics such as Russian olive (Eloegnus anqustifolia) and elm (Ulmus procera) have become established in some locations.

Wetland/riparian habitats have been greatly reduced in the West (13, 18). Most estimates indicate that only 10 percent of the original habitat remains today. The dependence of migratory birds and other vertebrates upon this vegetation type is similarly well documented (6, 7). Well over half of the avifauna present in portions of Arizona and New Mexico are dependent upon riparian habitat. Viewed from another prospective the removal of all riparian habitat will approximately halve the avian diversity of that area. We believe this to be the case in Truckee Meadows.

Migratory bird groups of particular interest in and along the Truckee River include non-game birds, hawks, owls, shore birds and waterfowl. Bird species found in and adjacent to Truckee Meadows are listed in Table 5. Waterfowl frequenting the Reno-Sparks-Truckee Meadows area include Canada goose, mallard, pintail, American widgeon, shoveler, cinnamon and greenwinged teals, canvasback, redhead, and bufflehead. The Meadows is utilized primarily for feeding and resting. Canada geese wintering in the Washoe Valley feed in

Table 5. Partial List of Birds of Truckee Meadows and Adjacent Areas[1/], [2/]

COMMON NAME	SCIENTIFIC NAME
Eared grebe	Podiceps caspicus
Pied-billed grebe	Podilymbus podiceps
Great blue heron	Ardea herodias
Black-crowned night heron	Nycticorax nycticorax
Whistling swan	Olor columbianus
Canada goose	Branta canadensis
Snow goose	Chen caerulescens
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
Green-winged teal	Anas carolinensis
Cinnamon teal	Anas cyanoptera
American widgeon	Mareca americana
Shovler	Spatula clypeata
Wood duck	Aix sponsa
Redhead	Aythya americana
Ring-necked duck	Aythya collaris
Canvasback	Aythya valisineria
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Barrow's goldeneye	Bucephala islandica
Bufflehead	Bucephala albeola
Ruddy duck	Oxyura jamaicensis
Common mergansers	Mergus merganser
Sharp-shinned hawk	Accipiter striatus
Cooper's hawk	Accipiter cooperii
Red-tailed hawk	Buteo jamaicensis
Rough-legged hawk	Buteo lagopus
Golden eagle	Aquila chrysaetos
Prairie falcon	Falco mexicanus
Merlin	Falco columbarius
American kestrel	Falco sparverius
California quail	Lophortyx californicus
Ring-necked pheasant	Phasianus colchicus
American coot	Fulica americana
Killdeer	Charadrius vociferus
Common snipe	Capella gallinago
Herring gull	Larus argentatus
California gull	Larus californicus
Ring-billed gull	Larus delawarensis
Rock dove	Columba livia
Mourning dove	Zenaidura macroura

1/ Lahontan Audobon Society

2/ U.S. Fish and Wildlife Service

Table 5. Continued

COMMON NAME	SCIENTIFIC NAME
Barn owl	Tyto alba
Short-eared owl	Asio flammeus
Belted kingfisher	Megaceryle alcyon
Common flicker	Colaptes auratus
Yellow-bellied sapsucker	Sphyrapicus varius
Williamson's sapsucker	Sphyrapicus thyroideus
Hairy woodpecker	Dendrocopos villosus
Downy woodpecker	Dendrocopos pubescens
Horned lark	Eremophila alpestris
Stellar's jay	Cyanocitta stelleri
Scrub jay	Aphelocoma coerulescens
Black-billed magpie	Pica pica
Clark's nutcracker	Nucifraga columbiana
Mountain chickadee	Parus gambeli
White-breasted nuthatch	Sitta carolinensis
Red-breasted nuthatch	Sitta canadensis
Pygmy nuthatch	Sitta pygmaea
Brown Creeper	Certhia familiaris
Dipper	Cinclus mexicanus
Bewick's wren	Thryomanes bewickii
Long-billed marsh wren	Telmatodytes palustris
Rock wren	Salpinctes obsoletus
Mocking bird	Mimus polylottos
American robin	Turdus migratorius
Mountain bluebird	Sialia currucoides
Townsend's solitaire	Myadestes townsendi
Golden-crowned kinglet	Regulus satrapa
Ruby-crowned kinglet	Regulus calendula
Water pipit	Anthus spinoletta
Cedar waxwing	Bombycilla cedrorum
Loggerhead shrike	Lanius ludovicianus
Starling	Sturnus vulgaris
Yellow-rumped warbler	Dendroica coronata
House sparrow	Passer domesticus
Western meadowlark	Sturnella neglecta
Red-winged blackbird	Agelaius phoeniceus
Brewer's blackbird	Euphagus cyanocephalus
Brown-headed cowbird	Molothrus ater
House finch	Carpodacus mexicanus
American goldfinch	Spinus tristis
Lesser goldfinch	Spinus psaltria
Rufus-sided towhee	Pipilo erythrophthalmus
Dark-eyed junco	Junco hyemalis
White-crowned sparrow	Zonotrichia leucophrys
Golden-crowned sparrow	Zonotrichia atricapilla
Song sparrow	Melospiza melodia

the pasture and agricultural lands of Truckee Meadows. Some nesting occurs in the area.

The logger head shrike (Lanius ludovicianus) has recently been identified as a sensitive species by the Service (28). Oakleaf and Klebenow (12) found no logger head shrikes in 1972 along the lower Truckee River. These birds were described as common in 1868. The loss of suitable nest trees or adjacent fields has been suggested as a factor in this difference.

Gary Herron (NDOW, personal communication) indicated that: "The majority of avian families indigenous to western Nevada are represented in vegetative communities adjacent to the Truckee River. A few of the species and groups that are presently associated with the Truckee River include the great blue heron, black-crowned night heron, sharp-shinned, Cooper's and red-tailed hawks, kestrel, merlin, and the bald eagle. There are also numerous passeriforms (perching birds), woodpeckers, hummingbirds, swifts, owls, gulls, terns and the double-crested commorant."

" Many of the species of wildlife that now occur on the Truckee River are dependent upon unique or selective habitat components. Any loss of habitat, especially wetland vegetation, would continue to reduce species diversity and total numbers. Habitat alteration and human encroachment have resulted in a population decline for many species that were dependent upon the Truckee's vegetative diversity. The yellow-billed cuckoo is one species that formerly nested in the dense stands of cottonwoods that were present adjacent to the river. Cottonwood regeneration is dependent upon periodic flooding to establish seedlings and maintain a wide belt of mature trees. Flood control measures and channeling the river have resulted in the loss of the yellow-billed cuckoo as a breeding species and the decline or loss of other wildlife species."

"The Swainson's hawk was referred to as a common nesting species by Robert Ridgeway during the 1880's. There has been only one Swainson's hawk nest located near the Truckee River in the last decade."

Fur bearing animals such as raccoon, long-tailed weasel, badger, striped and spotted skunks, river otter, muskrat, beaver, bobcat, and coyote inhabit the basin. Many are dependent on the marshes and riparian areas in the basin such as are found in Truckee Meadows and along the Truckee River in the vicinity of Reno.

The more common big game animals inhabiting the basin are mule deer, mountain lion, and black bear. The mule deer migrate semi-annually between high elevation summer ranges in the Sierra Nevada and winter ranges in the lower elevation foothills. A major mule deer winter range is located in the vicinity of the Reno-Verdi area; mule deer also utilize the Truckee Meadows area.

To place the remaining riparian habitat along the Truckee River in prospective we feel it is important to consider its history. A photograph taken in 1908, now in the Nevada Department of Wildlife Office, shows that the river and associated wetland vegetation were largely unaltered at that time. The Army Corps of Engineers dredged and diked portions of the river in 1923 and again in 1964 through Sparks. In 1970 Federal funds were used by the City of Reno and the State of Nevada for intermittent channel work through the study area.

The public and private interests have continued to remove wetland vegetation and structurally fill and restrict the river. Although some regeneration has occurred, the loss of wetland habitat has been substantial between uptown Reno and South Rock Blvd. Much of this loss has occurred during the last 30 years (Kay Johnson, NDOW, personal communication).

Similar changes have occurred along lower Steamboat Creek. An aerial photograph taken by the Corps in 1940 shows lower Steamboat Creek still supporting a partial canopy of cottonwood and a meandering channel. Now the trees are gone and the stream has been channelized.

During the 1970's both Reno and Sparks actively acquired lands along the banks of the Truckee River for recreational purposes. By 1977 Sparks had acquired 80 percent of its river bank lands and Reno had about 50 percent. Sparks has now acquired all of this land. Reno now has approximately 60 percent of the river banks. Sparks has also passed an ordinance excluding construction within 150 feet of the centerline. The State of Nevada now claims all lands in the Truckee River below the mean high water line and these are administered through the Nevada Division of State Lands. From a past trend of degradation, the wetland vegetation in and along the Truckee River has presently entered a period of relative stability. We assume that with this new status most of these lands will continue to support terrestrial resources without the project for the 50 year period of analysis.

We have used two approaches to estimate the acreage presently supporting wetland vegetation along the Truckee River within the project area. A Lasico 10A compensating polar planimeter was used to determine square inches on the August 3, 1982 construction maps which depicted wetland vegetation in large, irregular shapes. Where thin strips of vegetation occur along the river banks, linear distances were segmented by average width and measured with a K and E Model #620300 map measure. The resulting distances were multiplied by the average vegetation width to get square inches. The square inch figures were totaled and multiplied by our estimate of square feet per square inch, which was determined by measuring objects in the field for each aerial photograph. Then the total square feet were adjusted to report data in acres (Table 6). A total of over 219 acres of wetland vegetation existed along the Truckee River during May 1981. We estimate the average vegetative cover was 75% in the areas measured.

Without the project, state or local interests are anticipated to conduct minor channel excavation for flood control twice during the next 50 years. This could result in an average loss of about 1 acre of wetland vegetation over the 50 year period of analysis. However, Nevada Department of Wildlife would require mitigation (Bob McQuivey, personal communication). Thus, our estimate of wetland vegetation over the 50 year period of analysis remains 219 acres.

Along with the new found stability, these lands are now undergoing a new form of stewardship. The increasing human use of these areas is creating other forms of impact upon the vegetation and the wildlife which it supports. Some areas are being maintained as parks. In these areas understory vegetation is normally eliminated, lawns may be grown, and regeneration of native trees is limited. The cities have already revegetated several devastated areas and

Table 6. Existing wetland vegetation along the Truckee River, Nevada between Twin Lakes Blvd. and Vista Ave.

River Segment or Area	Acres
1 - Upstream end of project to Booth St.	75.30
2 - Booth St. to Keystone Ave.	1.64
3 - Keystone Ave. to Arlington Ave.	7.55
4 - Arlington Ave. to Sierra St.	2.25
5 - Virginia St. to Center St.	0.05
6 - Center St. to Lake St.	0.03
7 - Lake St. to Wells Ave.	7.44
8 - Wells Ave. to Hwy 395	12.75
9 - Hwy 395 to Glendale Ave.	6.06
10 - Glendale Ave. to Greg St.	6.77
11 - Greg St. to Rock Blvd.	10.83
12 - Rock Blvd. to McCarran Ave.	31.78
13 - McCarran Ave. to downstream end of project (Southern boundary-Kimlick Lane)	41.64
Total	219.09

they have plans to revegetate and develop other areas. However, in some instances exotic trees have been planted, which may not offer the same opportunities for wildlife expected from the natural species. It appears that during the 50 year period of analysis the total wetland area available to wildlife along the Truckee River without the project will be similar to the present area.

The primary interest of the cities is to develop parks, bike paths and related recreational facilities to accommodate the annual demand for hundreds of thousands of visitor days. The human use has, by itself, become an adverse impact upon wildlife and the vegetation which supports it. In particularly popular areas, understory vegetation is being inhibited directly through trampling. The presence of large numbers of people and pets tends to discourage use of the area by more timid forms of wildlife.

These changes in land status and associated impacts should reduce species diversity, although wildlife density may remain stable during the 50 year period of analysis. We expect greater numbers of birds characterstic of urban areas to occupy the habitat. Pigeons, sparrows, robins and semi-domestic waterfowl should increase in number while warblers, woodpeckers, wrens, and others may decrease in numbers or no longer use the habitat.

In 1980 the Bureau of Census figures show the City of Reno and Sparks had a combined population of 141,536. This was 73 percent of the population of Washoe County, and we estimate that 90 percent of Washoe County residents are within 20 miles of the study area.

Population in Washoe County is estimated to be 284,000 in 1990 and 348,000 by year 2,000 (Unpublished Paper, Bureau of Business and Economic Research, University of Nevada, Reno). According to the 1980 BEA Regional Projection, U.S. Department of Commerce Bureau of Economic Analyses, the combined populations of Reno and Sparks will be 416,140 and Washoe County will be 616,520 in 2040.

In 1980 the Service estimated that Americans over 16 years of age spent slightly more than two days each on nonconsumptive wildlife activities on trips more than one mile from their homes (27). Over 41 percent of these days were primarily for noncunsumptive wildlife activities. With this as a basis, we estimate that by 1990 in Washoe County there will be annual demand for 568,000 days of nonconsumptive wildlife use during trips greater than one mile from their homes in 1990. This would expand to 1,233,040 days by 2040.

In arid regions riparian wetland corridors attract a disproportionately large diversity of wildlife and high densities of some forms (6, 7, 13). Consequently, people interested in wildlife observation will also be attracted to riparian and other wetland areas.

Riparian wetlands are very limited in this region. The Bureau of Land Management, during development of the Reno Grazing Environmental Impact Statement, inventoried 657,898 acres of public lands surrounding Reno (23). Of this total only 475 acres supported riparian vegetation and only 23 percent of this was in good condition.

Consequently, the riparian wetlands along the Truckee River, with their proximity to the population center, with the present land status and with excellent access, are estimated to account for approximately one-third of the demand for wildlife observation in Washoe County. This proportion should increase to about one-half in the future as the population center continues to expand. Thus, the Truckee River riparian wetlands within the study area would be expected to provide about 189,333 user days in 1990, and by 2040 they would be expected to accommodate 616,520 user days. Without the project, wildlife in the Truckee River Wetlands should provide about 402,927 nonconsumptive user days annually. We feel that with the existing and anticipated competing uses, the existing 219 acres within the project area may not satisfy all of this demand through 2040.

Steamboat Wetland

The wetland located along Steamboat Creek south of Pembroke Drive and west of Hidden Valley would be classified as lacustrine emergent wetland under the National Wetland Inventory System (20). It occupied approximately 55 acres during May of 1980 and consists of open water and emergent wetland vegetation, primarily cattails (Typha sp). The marsh appears to be a natural feature. It is surrounded by pasture land which appears to be mostly irrigated. This is by far the largest marsh remaining in Truckee Meadows.

This wetland is heavily used by waterfowl and wetland dependent migratory birds for nesting, feeding and cover. The highest densities of Canada geese in Nevada are found in Truckee Meadows. Although most of these birds are wintering, the marsh does provide nesting cover for some. Three species listed as sensitive by the Fish and Wildlife Service which inhabitat the marsh are: Loggerhead shrike, Swainson's hawk and the willow flycatcher (3, 28). This area is believed to receive occasional visits by bald eagles and peregrine falcons (3). The importance of this marsh is increasing as similar habitats in Truckee Meadows and western Nevada diminish.

Steamboat Wetland supports approximately 60 broods of ducks, primarily mallards, and 12 broods of Canada geese annually. Total production is about 360 ducks and 60 geese annually (Norm Saake, NDOW, personal communication). Average waterfowl production for this 55 acre wetland is approximately 10 birds per acre. It was estimated that, in the entire area between Huffaker Hills and Truckee River, 400 to 500 ducks are produced annually (Larry Barngrover, NDOW, personal communication (4). Steamboat Wetland is estimated to support about 100,000 waterfowl use-days annually.

The future of this wetland is uncertain. All lands in the vicinity are private holdings. Subdivisions are now built within 2,000 feet of the east and west edges of the marsh. Portions of the subdivisions to the west, Donner Springs and adjacent developments, have been built upon fill material to reduce the probability of flooding. A substantially greater depth of fill would be necessary to provide a reasonable degree of flood protection in this wetland. At this time costs of construction in the area appear prohibitive but land is expensive in Truckee Meadows and the proximity of other developments tends to increase land values while encouraging development. It is also possible that the marsh will be drained for other agricultural purposes. The marsh is a

private holding and public access has not generally been available. This is unlikely to change without the project.

Steamboat Creek drains a large area which is rapidly being converted from agricultural to urban use. By year 2000 Steamboat Creek would be contributing one third (103 cfs) of the urban drainage from a two year summer storm in Truckee Meadows. Presently, water quality in Steamboat Creek is poor (29). Suspended solids and nutrients are already a problem. With existing land use suspended solids reach 22,000 pounds per hour and total phosphorus reaches 20 pounds per hour during high water. By 2000 these figures would reach 39,000 and 35 pounds per hour for suspended solids and total phosphorus, respectively. Both these parameters impact fisheries in the lower Truckee River, including the ongoing recovery efforts for threatened Lahontan cutthroat trout and cui-ui.

Steamboat wetland appears to be improving water quality in Steamboat Creek along the Truckee River (20). During low flow winter conditions in February 1981, 50 percent of the total suspended solids were removed from Steamboat Creek and water passed through Steamboat Wetland. Also, Kieldahl nitrogen was reduced by 23 percent and total dissolved solids were reduced by 10 percent. At the time of this analysis Steamboat Creek and Boynton Slough were contributing 23.7 percent of the total dissolved solids in the Truckee River at Vista. To control nonpoint source pollution from Truckee Meadows, Steamboat Creek has been identified as one of two major drains which could be modified to serve as a sediment and nutrient trap (29). Steamboat wetland has been suggested as the logical area for this purpose.

There are no recreational use data available. Steamboat wetland has provided sport hunting to members of the Silver State Gun Club.

Boynton Slough

Portions of Boynton Slough east of South McCarran Blvd. are supporting good stands of willows and cattails. It appears that part of this reach of Boynton Slough has been channelized in the past. We assume that this area will remain vegetated in its present level without the project.

2. Future With the Project

This section describes anticipated biological and socio-economic conditions with the proposed flood control structures in place over the 50-year life of the project. Both positive and negative impacts to key fish and wildlife habitats and populations are addressed, and these impacts are related to human use. Project impacts to fish and wildlife on the Truckee River system and adjacent areas would be primarily related to the presence or absence of the proposed structures, associated construction zone impacts and maintenance.

a. Aquatic Resources

The project will cause the loss of riparian habitat, the disruption of the streambed, increased sedimentation, and alter water quality. The adverse impact of these losses will progressively accumulate downstream. The following analysis of the project's impact on aquatic resources is directed toward the accumulated impact, and in a few instances, toward individual impacts.

Riparian Habitat

Shade produced by the streamside vegetation canopy strongly influences water temperature. Any change in the amount of shade over the stream will alter water temperatures which in turn regulate the physical and biotic characteristics of streams (16). Reduction in vegetation density will bring about a greater change in available shade than modifications of vegetation height, stream width, and distance of vegetation from the stream (16). Any change, however, that allows for increased solar radiation will warm the water and reduce the cooling-off period during summer nights. The impact of such changes can be tremendous since approximately 53% of the total incident light may be transformed into heat (17). Removing the vegetation will allow several detrimental patterns to develop: "(a) Increases in temperature will occur during summer periods resulting in increasing rates of phosphorus disassociation from sediments; (b) increases in phosphorus concentrations in the drainages result in higher nutrient concentrations in receiving bodies such as lakes and reservoirs; and (c) increasingly larger blooms of nuisance algae and periphyton will appear because of elevated nutrient concentrations, temperatures, and light availability" (8). These changes in turn may cause shifts in the entire structure of aquatic communities. A shift in community structure may occur with resident species being replaced by the frequently less desirable species which are more tolerant of these changes.

The Corps estimated that the project will remove 1.32 miles of shade producing vegetation from the river's north and south banks. If this vegetation is lost instantaneously, the Corps predicts that the potential maximum accumulated increase in temperature within the project area would be 1.65^{o}F. This worst case prediction is based upon an average increase of 1.25^{o}F per mile without the project. The potential accumulated increased temperature is estimated by simply multiplying 1.25^{o}F per mile by the miles of shade producing vegetation that will be removed. Such a temperature increase would enlarge the avoidance area for salmonids within Truckee Meadows when unusually low discharges occur in the summer and fall. These increases will also contribute to cumulative temperature problems downstream of Truckee Meadows.

The removal of riparian vegetation will also adversely impact the food supply of salmonids. Terrestrial insects that are blown from streamside vegetation or are washed from the shore may provide a large percentage of the salmonid's diet. Kennedy (9) found that terrestrial insects were an important food source (13%-34% of the total number of food organisms ingested) for adult trout in Mono County, California. Of course, the relative importance of these insects will depend upon the size of the stream, location, riparian vegetation, and time of year. We did not have the time and funding to appraise this impact nor sufficient data to speculate on the amount of adverse impact it will have on the food supply of salmonids. Therefore, we have not addressed this in the Summary of Impacts nor in the Mitigation Plans.

Streambed Alteration and Sedimentation

The Service and the Corps concur that dredge and fill operations would disrupt approximately 49 acres of aquatic habitat, which is 40 percent of the habitat between Hunter and Steamboat Creeks. By disrupting the streambed, such dredge and fill operations would cause a layer of fine material to cover the streambed immediately downstream of each construction site. This will cover essential spawning grounds of brown trout and whitefish, thus preventing these fish from using the area. If it occurs after eggs have been lain, most of the eggs and recently hatched fry, if not all, will be suffocated (8, 17).

Deposition of suspended material will reduce species diversity and abundance of benthic communities. Many of these organisms are food items for salmonids. Such a reduction in available food will reduce the river's carrying capacity for salmonids. Koch and Hainline (10) found that the aquatic invertebrate community below Derby Dam was severely reduced when the dam's backpool was flushed. Nearly six months were required for reestablishment of the benthic community.

Channel excavation in the vicinity of Wingfield Park would create fish passage problems. There is a dam across each river channel around the island at Wingfield Park. These recreational dams are permanent concrete structures with removable splash boards for additional impoundment during the summer of selected years. Both dams have fish ladders at the south end which are considered marginally useful. They may pass fish at some flows. Excavation of the river bed by 1.5 feet would leave the existing fish ladders inoperable and the dams impassable to fish migrating upstream under most conditions.

Fish Resources and Fishery

Dredge and fill operations associated with the project interact with the removal of riparian vegetation to temporarily modify the fish community structure. The loss of riparian vegetation may increase water temperatures on rare occasions to the avoidance stage, thereby decreasing coldwater fish populations. We assume, however, that these detrimental impacts will be minimal since the Corps has assured us that they will use the appropriate and necessary sediment control techniques to comply with State standards for turbidity. Based upon this assurance, we believe the loss in angler-days and detrimental impact to salmonids in the project area from construction and siltation, when spread over the life of the project, will be no greater than those lost or impacted through periodic maintenance activities if the project is not built.

The project would largely preclude upstream passage of fish at Wingfield Park recreational dams. It is estimated that this would result in a 10 percent loss in the 30,000 angler-days supported by the natural salmonid population. Thus, about 3,000 angler-days would be lost annually.

A detailed analysis of the impact the project will have on the two endangered/threatened fish species will be addressed in the Corps' Biological Assessment and in a Section 7 consultation pursuant to the 1973 Endangered Species Act, as amended.

b. Terrestrial Resources

Truckee River Wetlands

A wide array of structural approaches are being proposed to provide flood control through Truckee Meadows. Project impacts upon wetland wildlife habitat would be site specific. The extent of impact will depend upon the construction zone required, the type of permanent structures, maintenance plans, and the extent of vegetation present on the site. Accordingly, we have assessed the impacts to wetland vegetation on a site by site basis.

The following construction zone widths, formulas, and approaches were used to quantify wetland vegetation losses:

Setback floodwalls, all heights = 30 feet

Waters edge floodwalls, all heights = 30 feet

Setback levees = (5 x height) + 12 foot crown + 15 foot road easement

(The assumption has been made that the construction zone equals the finished structures)

Channel excavation, above 1,000 cfs contour = area measured

Channel excavation, one bank = 3 x height beginning at waters edge

Channel excavation, conventional = all vegetation within channel

With this as a basis, the entire construction area was surveyed. Vegetation was classified and marked on photographic reproductions of the study area with the approximate scale of 200 feet to the inch after which two approaches were used. When small areas or narrow strips of vegetation were encountered a direct estimate of the aerial extent was made. This produced an estimate of absolute (100 percent) vegetative cover. In project areas with diverse or discontinuous vegetation, estimates of percent cover of the major vegetation types were made. These percentages were then applied to the total construction zone in the segment to provide an estimate of absolute vegetative cover. All figures were corrected for minor variations in the photo scale.

Two of the areas included in this analysis are unique in that they will be excavated down to the approximate elevation of the Truckee River when discharge is 1,000 cubic feet per second. The areas are Glendale Park and the overflow inlet area east of South McCarran Boulevard. These areas should be moist near the surface, and it is assumed they will revegetate naturally. However, they will be subject to intense flows, and it is anticipated that this vegetation will be scoured out occasionally. It is assumed that these areas will be maintained to grade twice during the 50 year life of the project. For this analysis we will assume that these areas will support riparian vegetation with 50 percent cover and that this vegetation will average 45

percent mature during the life of the project. The data are summarized and reported as absolute acreages of wetland vegetation lost to the project using major landmarks for segment divisions (Table 7). With the proposed project, a total of 19.14 wetland acres with absolute cover would be lost.

Natural wetland vegetation along the Truckee River is rarely found with absolute cover. Approximately 75 percent cover appears typical. The absolute acreage involved in these losses would occupy about one third greater area under typical site conditions. Accordingly, the total project, including Boynton Slough, would result in a loss of 25.52 acres of wetlands.

Short-term vegetative losses would occur during the 6 year construction period and the approximately 20 year period required for vegetation to reach maturity. To estimate this loss it is assumed that during the 6 year construction period there will be a 75 percent average loss and during the next 20 years there will be a 37.5 percent average loss. In developing these estimates it was assumed that some mitigation areas would be planted during the first and subsequent years of construction. Applying the above relationship for annualized vegetative losses to the sum of project losses, 25.52 acres produces a total project loss of 30.99 acres over a 56 year period of analysis. This is 13 percent of the existing wetland vegetation.

It is unlikely that natural revegetation will occur on most of these impacted sites. The setback floodwalls are generally built where their bases are well above soils which would be regularly moistened by the river. Thus, cottonwood and willow are not expected to invade the construction zones. Waters edge floodwalls would consume relatively little vegetation. They are primarily replacement structures at the present waters edge. Revegetation is not likely to occur adjacent to these floodwalls because of periodic high water velocity, coarse substrate and in some instances almost continuous inundation. Setback levees and maintenance roads are designed to be maintained barren with the exception that grasses will be allowed to grow. Channel excavations, one bank and conventional, are assumed to represent total vegetative losses.

Assuming direct relationships apply, both wildlife and human use of the Truckee River wetlands over the life of the project will be reduced by 13 percent. Thus, in 1990 this area would provide only 164,720 user days and by 2040 this would drop to 536,372 user days. With the project, Truckee River wetlands would provide an average of approximately 350,546 nonconsumptive wildlife user days. This is a loss of 52,381 user days when comparison is made to without project conditions.

Steamboat Wetland

The 55-acres of wetland on Steamboat Creek would not be directly involved in construction activities. The proposed project would place levees along Steamboat Creek and its tributary, Boynton Slough. These levees would be 1,500 to 2,000 feet away from the wetland on the east and west. A flowage easement would be acquired on this wetland and the surrounding pasture. Thus, potential to develop the area for municipal or industrial use should

Table 7. Project related wetland losses.

River Segment or Area	Project Acreage Evaluated	Absolute Wetland Acreage Loss
1 - Booth St. to Keystone Ave.	.59	.41
2 - Keystone Ave. to weir at Arlington Ave.	.74	.56
3 - Weir at Arlington Ave. to Sierra St.	.22	.17
4 - Virginia St. to Center St.	.05	.04
5 - Center St. to Lake St.	.03	.02
6 - Hwy 395 to Glendale Ave.	.26	.07
7 - Glendale Ave. to Greg St.	.31	.07
8 - Greg St. to Rock Blvd.	2.52	.89
9 - Rock Blvd. to McCarran Ave.	13.43	5.61[a]
10 - McCarran Ave. to downstream end of project (southern boundary - Kimlick Lane)	29.43	9.31[a]
Subtotal Truckee River losses (Segment 1-10)		17.17
Boynton Slough and Steamboat Creek (northern boundary - Kimlick Lane)	9.64	1.97
Sum of Absolute Losses		19.14
Adjusting to 75 percent vegetative cover		25.52
Annualization of short-term wetland losses		5.47[b]
Total of wetland losses		30.99

a. Excavated areas at Glendale Park and adjacent to the overflow weir east of South McCarran Blvd. It is assumed that these areas will be maintained twice during the 50 year life of the project, they will naturally support 50% vegetated cover and this vegetation will average 45% mature during this period.

b. Consideration given to the sequence of vegetative losses over the 6 year construction period. It is assumed that vegetation would require 20 years to reach maturity.

be eliminated. The future of this marsh would remain at the discretion of the landowner. Incentives to drain the area may remain since other forms of agriculture may become desirable in the future.

Boynton Slough

Most of the impacted wetland vegetation along Boynton Slough is located immediately east of the South McCarran Blvd. crossing and consists primarily of willows and cattails. Impacts to wetland vegetation were quantified using the approach for setback levees described above. Approximately 1.97 acres of wetland vegetation with absolute cover would be lost. This should be expanded by one third to approximate the actual wetland acreage involved. Thus, 2.62 acres of wetland vegetation would be lost over the 50 year life of the project.

SUMMARY OF IMPACTS

Direct and indirect project impacts are summarized in Table 8. We consider the loss of 28.37 acres wetland/riparian habitat along the Truckee River to be the most significant project impact. This loss directly impacts migratory birds and indirectly the Truckee River fisheries, through the loss of shade which would increase water temperatures. This vegetation also contributes to the aquatic food base. Other impacts include the loss of vegetation along Boynton Slough and by the alteration of the Truckee River's streambed. We assume that detrimental impacts to the fishery resources will be minimal since the Corps has assured us that they will use the appropriate and necessary sediment control techniques to comply with the State of Nevada's standards for turbidity. Based upon this assurance, we believe the loss in angler-days and detrimental impact to salmonids in the project area, when spread over the life of the project, will be no greater than those which may be expected through periodic maintenance activities if the project is not built.

A detailed analysis of the impact the project will have on the two endangered/threatened species will be addressed in the Corps' Biological Assessment and in a Section 7 consultation pursuant to the 1973 Endangered Species Act, as amended.

Table 8. Summary impacts on aquatic and terrestrial resources over the 50 year life of the project.

	Future without Project			Future with Project					
				Without F&W Recommendations			With F&W Recommendations		
	Surface acres	Angler days [1/]	Visitor days [2/]	Surface acres	Angler days	Visitor days	Surface acres	Angler days	Visitor days
Truckee River (sediment and streambed disruption)	123	101,189	-	123	98,189	-	123	101,189	-
Truckee River (riparian and wetland vegetation)	233	-	402,927	200	-	330,546	233	-	402,927
Steamboat Creek (wetland plan)	55	0	50	55	0	50	160	0	50,000
Steamboat Creek (wetland extension plan)	2.84	0	0	2.84	0	0	9.49	0	20,000
Boynton Slough (wetland vegetation)	2.62	0	0	0	0	0	2.62	0	5,200

1/ Average annual angler-days directed toward naturally produced salmonids during the 50 year life of project. It is not logical to separate angler-days associated with the streambed from those associated with riparian vegetation. They are dependent variables, therefore inseparable.

2/ Average annual visitor days over the life of the project are assumed to be almost entirely nonconsumptive.

MITIGATION PLANS

This section discusses mitigation measures developed to offset project induced losses of fish and wildlife resources. The most significant direct project impact would be upon palustrine forested and scrub-shrub wetlands along the Truckee River. These areas fall under Resource Category 2 of the Service Mitigation Policy, since this habitat is relatively scarce on a national basis. The Service Mitigation Goal is "no net loss of in-kind habitat value." Prior Service input has already contributed to substantial avoidance and minimization of habitat losses.

The mitigation needs presented herein are based on Service mitigation policy, current scientific information, analysis of project impacts, field observations, surveys and input from Nevada Department of Wildlife. A wide array of mitigation measures were reviewed while selecting and developing mitigation plans. Feasibility of accomplishing stated purposes has been the primary consideration in the formulation of the following mitigation plans. The Service will continue review of this aspect of the project and will consider all suggestions received.

a. Aquatic Resources

1. Fish Ladders

Proposed channel excavation in the Arlington Avenue area would perch the existing fish ladders at the Wingfield Park recreational dams. These structures would be inoperable after channel excavation. It is recommended that removal of these dams be made a feature of this project. If these dams are to be retained, the fish ladders should be reconstructed to pass salmonids.

b. Terrestrial Resources

1. Truckee River Wetland Plan

Truckee River wetland losses may be mitigated by revegetation of 28.37 acres with cottonwood and willow along the Truckee River and Steamboat Creek. South bank revegetation is most important because it will serve wildlife, fisheries and human needs simultaneously. Major south bank areas which appear suitable include:

South Bank of Truckee River

1. River mile 44.381, east end of project, to river mile 46.880 (10,525 linear feet); excluding well vegetated clumps. The average width would be 50 feet. Grading may be necessary. 12.08 acres

2. River mile 47.100 to South McCarran bridge (2,100 linear feet by 50 feet) 2.41 acres

3. River mile 47.800 to river mile 48.098, near Glendale Park (1,000 linear feet by 50 feet) 1.15 acres

4. River mile 48.604 to river mile 48.840; both sides of South Rock bridge (800 linear feet by 50 feet) 0.92 acres

5. River mile 48.840 to linear mile 49.051; South Rock Blvd. West (1,000 linear feet by 25 feet) 0.57 acres

   This strip would contain one row of cottonwoods 25 feet on center and one row of willows 10' on center.

6. River mile 49.140 to Greg Street bridge (1,000 linear feet by 50 feet) 1.15 acres

7. Greg Street bridge to river mile 49.884; adjacent to MGM Casino and Hotel (2,400 linear feet by 25 feet) 1.37 acres

   This strip would contain one row of cottonwoods 25 feet on center and one row of willows 10' on center, of which both rows will be on the north side of the bike path

8. River mile 50.137 to Highway 395 bridge (1,070 linear feet by 50 feet) 1.23 acres

On most of these sites, two rows of cottonwoods 25 feet on center and two rows of willows 10 feet on center should be established and maintained. The normal waters edge should be left to revegetate naturally. The exceptions to this would be (Number 5 and Number 7 described above). The above recommended spacing gives consideration to the initial periods of growth and loss of larger trees over the 50 year period. Other smaller sites may exist on the south bank and these should be given preference over the north bank sites for revegetation.

North bank sites which run mostly north and south can also serve the same mitigation purposes, including shading of the Truckee River. Major north bank areas which appear suitable include:

9. River mile 49.784 to river mile 49.984, Glendale Avenue to South Rock Blvd. (800 linear feet by 25 feet as in Number 5 above) 0.46 acres

10. River mile 47.377 to river mile 47.470, east of South McCarran Blvd. Bridge (600 linear feet by 50 feet) 0.69 acres

11. River mile 46.915 to river mile 47.115 west of Cottonwood Park (800 linear feet by 25 feet, cottonwood only) 0.46 acres

12. River mile 46.713 to river mile 46.852, east of Cottonwood Park (734 linear feet by 25 feet) 0.42 acres

13. River mile 45.960 to river mile 46.170 east of Cottonwood Park (1200 linear feet by 25 feet) 0.69 acres

14. River mile 45.460 to river mile 45.760 east of Cottonwood Park (1300 linear feet by 25 feet) 0.75 acres

15. River mile 44.450 to river mile 44.850, east of Cottonwood Park, (1700 linear feet by 25 feet) 0.98 acres

This is a total of 25.33 acres. The remaining 3.04 acres should be mitigated by planting cottonwood along Steamboat Creek immediately south of the Truckee River. A total of 2,648 feet of each bank of Steamboat Creek should be planted with one row of cottonwood at 25 feet on center.

In calculating the losses the assumption was made that revegetation would begin during the first construction season. It appears that identified areas on the eastern end of this project along the Truckee River and along Steamboat Creek would be available for planting during construction year one. If this cannot be done, we will need to adjust the total project loss to be mitigated.

In addition to the recommended plantings, long-term maintenance activities such as watering, replanting, and depredation control will need to be preformed.

2. Boynton Slough Wetland Plan

Mitigation for the loss of 2.62 acres of wetland vegetation in the Boynton Slough area may be accomplished by planting two rows of cottonwood at 25 feet on center along Steamboat Creek north of Pembroke Drive. Approximately 2,283 linear feet along Steamboat Creek planted and maintained in this manner would mitigate this loss.

ENHANCEMENT PLANS

This section discusses fish and wildlife enhancement plans which we feel may be incorporated into the project. These plans are intended to enhance fish and wildlife populations and opportunities for human use. A wide array of enhancement possibilities have been considered while selecting and developing these plans. Feasibility of accomplishing stated purposes has been the primary consideration in the formulation of the following enhancement plans. The Service will continue to review this aspect of the project, considering all suggestions received.

a. Aquatic Resources

1. Fish Habitat Improvement

In the channel excavation areas near Booth Street and Arlington Avenue, fish habitat may be enhanced through addition of groups of large (greater than 5 feet in diameter) boulders. The area near Bell Avenue and other relatively wide sections could also be improved for fish in this way. The number and distribution of boulder groups would be determined at a later date. Mr. Bob McQuivey (NDOW, personal communication) has indicated information on the distribution of boulders would be provided upon request. Habitat provided by large boulders would promote the recovery of threatened Lahontan cutthroat trout in support of the Endangered Species Act. A more immediate benefit would be improved habitat for rainbow trout, brown trout, and whitefish. A request will be made to the Cities of Reno and Sparks to assume responsibility for operations and maintenance.

b. Terrestrial Resources

1. Steamboat Wetland Plan

The proposed project would place Steamboat Wetland and the lower mile of Boynton Slough under a flowage easement. This may preclude some forms of development, but wetland drainage would always be a possibility. In addition to the obvious benefits to waterfowl and other migratory birds, the Nevada Division of Environmental Protection has gathered data showing the ability of the existing wetland to improve water quality. Thus, the perpetuation and possible expansion of this wetland to include Boynton Slough could benefit fisheries in the lower Truckee River and Pyramid Lake, including threatened Lahontan cutthroat trout and endangered cui-ui. Leonard Crowe, (Washoe Council of Governments, personal communication) estimated that about 40 acres of ponds with various configurations would be sufficient to accomplish sedimentation for both Steamboat Creek and Boynton Slough. Associated with this would be approximately 120 acres of emergent wetland vegetation which would control nutrients and heavy metals, and a gravel filter. It is envisioned that a total of approximately 300 acres would be involved.

Typically, Steamboat Creek and its tributary Boynton Slough discharge about 18 percent of the total phosphorus load in the Truckee River (Leonard Crowe, Washoe Council of Governments, personal communication). When implemented the proposed wetland enhancement plan should remove between 30 and 45 pounds per day (Jim Williams, Nevada Division of Environmental Protection, personal communication) and decrease the total Truckee River load by about 14 percent. It is expected that this wetland would have the ability to remove a similar proportion of the nitrogen before it reaches the Truckee River.

Nutrient stimulation of aquatic vegetation has been documented as a cause of substandard oxygen levels in the Truckee River. Nutrient stimulation is also believed to be the major contributor to extremely low intragravel dissolved oxygen levels which are precluding spawning of fish through low river flows in normal and less than normal water years. In response to this problem the Environmental Protection Agency and the Cities of Reno and Sparks have recently spent $22,000,000 to upgrade wastewater treatment facilities. The present facility is removing about 90 percent more phosphorus than the previous facility. Planning is underway to expand this facility and include nitrogen removal. It is unclear at this time whether or not this facility alone will be able to control nutrients to a sufficient level to consistently maintain water quality standards in the Truckee River. The future is even less certain. Even with advanced wastewater technology, it may be very difficult to avoid polluting the river. The nutrient removal capabilities of the Steamboat Wetland Plan should be very valuable in maintaining water quality in the Truckee River and this will support ongoing recovery efforts for threatened and endangered species.

The potential for this plan to enhance migratory bird habitat appears very high. Most migratory bird species presently using the area should benefit, but the only available data is on waterfowl. Piest (15) studied Pintail Lake near Show Low, Arizona. This is a wastewater disposal area of about 50 acres. There are three ponds with a total of about 40 acres of open water and 15 islands. In 1982 there were approximately 2,750 ducks produced at Pintail Lake. We estimate that Steamboat Wetland could produce at least 2,750 ducks and 120 geese annually. This would be a net gain of about 2,450 birds per year. Considerations in this estimate include; three times the total wetland acreage of Pintail Lake, a similar area of open water, lower but substantial nutrient inflow, many similarities in physical setting and the knowledge now available to design such an area. We estimate total waterfowl use-days could be increased from 100,000 to approximately 545,000 per year with greatest gains in the nesting period.

Benefits have been estimated on this 300 acre site with 160 acres of wetlands. If within the life of this project urban pollution would warrant expansion of the wetland, benefits would be proportionally increased.

We believe this proposed project area may appropriately be administered by the Service. For operation and management of this area the Service would look to the City of Reno. Secondarily, this area could serve as a wildlife interpretative area while satisfying the Washoe County 208 Water Quality Management Plan and a segment of the Environmental Protection Agency's Special Grant Conditions for the Early Start Project wastewater treatment facilities. We estimate this area could support about 50,000 visitor days annually. A letter seeking tentative concurrence in assuming management responsibilities has been submitted. This letter and the response are appended to this report.

Since this enhancement plan would support the perpetuation of endangered species and the migratory bird program, we believe first costs may be 100 percent Federal.

2. Steamboat Creek Wetlands Extension Plan

After mitigation needs are accounted for, the remaining 8,270 feet of Steamboat Creek, north of Pembroke Dirve, is recommended for revegetation with cottonwood. Plantings on both banks with trees at 25 feet on center are recommended. This would represent approximately 9.49 acres.

This plan would reduce water temperature during the warm months to the benefit of threatened Lahontan cutthroat trout and endangered cui-ui in the lower Truckee River. A Bureau of Reclamation study on the lower Truckee River between Derby Dam and Nixon serves as the best available starting point to make an estimate of the extent of temperature change which can be expected (19). Like Steamboat Creek this section of the lower Truckee River flows primarily north. However, Steamboat Creek is in a much more confined channel, it is deeper when similar flows occur, and in some cases vertical, 8-10 foot, banks occur.

Under normal July conditions with 40 cfs the 28 river mile reach of the lower Truckee River between Derby Dam and Nixon would gain an average of 0.82°F per mile when the shade factor varies from zero to 100 percent. With a greatly improved air surface to volume ratio in Steamboat Creek and an average shade factor over the life of the project of 90 percent, temperature in lower Steamboat Creek should be reduced by about 1.5°F per mile. Under low flow summer conditions Steamboat Creek contributes about 15.5 percent of the flow in the Truckee River at Vista. The 8,270 feet of Steamboat Creek in this enhancement recommendation could drop temperature by 2.35°F in Steamboat Creek and 0.35°F in the Truckee River below Steamboat Creek. Thus, this enhancement measure could keep approximately 1/3 additional mile of the lower Truckee River inhabitable for threatened and endangered fishes during critical periods.

Water temperatures would also be reduced during the spring and fall. In the fall some of the lowest discharges have been recorded. This

reduction in discharge is somewhat off-set by the lower sun angle and reduced insolation. In the spring spawning period for cui-ui and Lahontan cutthroat trout, water temperatures are also potentially limiting. The primary purpose of Stampede Reservoir on the Little Truckee River is to provide supplemental water for the perpetuation of these species. To date most of the Stampede releases have been made in support of fish reproduction. Temperature is a very important consideration in the complex formula leading to Stampede Reservoir releases. Any reduction of water temperature in the lower Truckee River would be beneficial. The reductions in Truckee River water temperatures from this proposed enhancement feature are presented in Table 9. These are based on the existing water distribution regime.

We believe this proposed project area may appropriately be administered by the Service. For operation and management of this area the Service would look to Washoe County. A letter seeking tentative concurrence in assuming management responsibilities has been submitted. This letter and the response are appended to this report.

This area could also serve as a recreational site and provide opportunities for wildlife observation. We estimate this area could support about 20,000 visitor days annually.

Table 9. The relationships between Steamboat Creek discharge, Lower Truckee River discharge at Vista and Nixon and possible temperature changes for selected months during a draught year (1977) and a typical year (1979) with the proposed Steamboat Creek enhancement plan. Normal air temperatures are assumed.

Month Year	Monthly Average Steamboat Creek Discharge[1]	Truckee River at Vista			Truckee River at Nixon		
		Monthly Average Discharge	Percent from Steamboat Creek[2]	Temperature Change °F	Monthly Average Discharge	Percent from Steamboat Creek	Temperature Change °F
May 1977	71	302.0	23.5	-0.46°	58.0	Probably No Spawning	
July 1977	28	181.0	15.5	-0.36	-	-	-
Sept. 1977	16	137.0	11.7	-0.23	-	-	-
May 1979	67	1256.0	5.3	-0.10	532.0	5.3	-0.10
July 1979	50	302.0	16.5	-0.38	-	-	-
Sept. 1979	58	255.0	22.7	-0.44	-	-	-

1 Data from Federal Water Master's Office in cubic feet per second

2 Data from U.S. Geological Survey. Water Resources Data for Nevada, 1977 and 1979.

RECOMMENDATIONS

We recommend the following measures be incorporated into and made part of the selected project to mitigate and enhance aquatic and terrestrial resources:

1. To mitigate fishery impact of channel excavation in the Arlington Avenue area the Wingfield Park recreational dams should be removed or fish ladders should be rebuilt to pass salmonids.

2. To mitigate the loss of 28.37 acres of riparian habitat along the Truckee River this same acreage should be reestablished and maintained with cottonwood and willow along the south and north banks of the Truckee River and Steamboat Creek as described under Mitigation Plans above.

3. To mitigate the loss of 2.62 acres of wetland vegetation in the Boynton Slough area another 2,283 linear feet of Steamboat Creek north of Pembroke Drive should be established and maintained with cottonwood.

4. To enhance trout habitat the placement of groups of large boulders (greater than 5 feet in diameter) is recommended. Numbers and locations are yet to be determined.

5. To enhance migratory bird habitat, and habitat for threatened and endangered species, we recommend that the Steamboat Wetland and the lower end of Boynton Slough be purchased and developed in support of the Migratory Bird and Endangered Species programs. Simultaneously this site could serve as a wetland park and means of controlling nonpoint source pollution. This area, about 300 acres, is planned for purchase under a flowage easement to satisfy other project requirements.

6. To enhance migratory bird and fishery habitat along Steamboat Creek and in the lower Truckee River, the 8,770 feet remaining along Steamboat Creek after mitigation should be planted and maintained with cottonwood.

7. Site preparation for fish screens is recommended as an efficiency measure for federal spending. Water diversions from the Truckee River are known to cause substantial losses of juvenile and adult salmonids. Within the project area, Idlewild, Wingfield, Cochran Ditch, North Truckee Ditch, Sission Ditch, and the Pioneer Ditch diversions are contributors to this problem. The intake structures for some of these ditches would be modified by the proposed project. Fish screens should be installed at several of these diversions which are likely to have long-term use. However, the Bureau of Reclamation was authorized under the Washoe Project Act of 1956 to screen water diversions along the Truckee River. There is a possibility that this project would be constructed before the Reclamation project is completed. Should this occur we recommend that, when reconstructing intake structures, these structures be modified to accept fish screens at a later date. We visualize this as a practical measure through which a small expenditure initially may preclude a much larger expenditure at a later date. Consideration should be given to sizing, the future use of the diversion and the design. We have requested cooperation and concurrence from the Bureau of Reclamation on this feature. See our letter of

April 12, 1983 and the reply appended to this report. We recommend the proven design developed by the California Department of Fish and Game. Arrangements for administration operations and maintenance would be as prescribed under the Washoe Project Act. Fish screens would promote the recovery of threatened Lahontan cutthroat trout in support of the Endangered Species Act.

LITERATURE CITED

1. Army Corps of Engineers. 1979. Alternatives Environmental Working Papers: Truckee Meadows Investigation (Reno-Sparks Metropolitan Area), Nevada. Sacramento District, Corps of Engineers, Sacramento, Calif.

2. Army Corps of Engineers. 1980. Truckee Meadows Investigation (Reno-Sparks Metropolitan Area) Nevada: Information summary on Alternatives for Flood Control and Related Water Problems. Sacramento District, Corps of Engineers. Sacramento, Calif.

3. Army Corps of Engineers. 1982. Draft Summary of the Recreation and Fish and Wildlife Plan, Truckee Meadows Investigation (Reno-Sparks Metropolitan Area) Nevada Sacramento District Corps of Engineers, Sacramento, Calif.

4. Barngrover, Larry, November 1978, Nevada Department of Fish and Game Personal Communication. In: Army Corps of Engineers. 1977. Environmental Inventory Truckee Meadows California and Nevada. 101pp.

5. Bell, Milo C. 1973. Fisheries Handbook of Engineering Requirements and Biological Criteria. Fisheries-Engineering Research Program, Corps of Engineers, North Pacific Division, Portland, OR

6. Hubbard, John P. 1977. Importance of Riparian Ecosystems: Biotic Considerations. In: Johnson, R. Roy and D.A. Jones. 1977. Importance, Preservation and Management of Riparian Habitat: A Symposium. USDA Forest Service General Technical Report RM-43.

7. Johnson, R. Roy, L.T. Haight and J.M. Simpson. 1977. Endangered Species vs. Endangered Habitats: A Concept. In: Johnson, R. Roy, and D.A. Jones. 1977. Importance Preservation and Management of Riparian Habitat: A Symposium. USDA Forest Service General Technical Report RM-43.

8. Karr, James R., and Isaac J. Schlosser. 1977. Impact of Nearstream Vegetation and Stream Morphology on Water Quality and Stream Biota. Environmental Protection Agency, Ecological Research Series, EPA-600/3-77-097, August 1977. 90pp.

9. Kennedy, H.D. 1969. Seasonal Abundance of Aquatic Invertebrates and Their Utilization by Hatchery-Reared Rainbow Trout. Technical Paper 12., U.S. Dept. of the Interior, Fish and Wildlife Service. 41pp.

10. Koch, D.L., and J.L. Hainline. 1976. Benthic Macro-invertebrate Population in the Truckee River, Nevada-California, with reference to river flow and water quality. Water Resources Center Project Rep. 41. Desert Research Institute, Univ. of Nevada, Reno.

11. Leeds, Hill and Jewett, Inc., 1982. Truckee Meadows Investigation (Reno-Sparks Metropolitan Area) Nevada, Plan For Channel Modifications, Truckee River Twin Lakes Drive to U.S. Highway 395 (River Mile 55.12 to 50.49). Sacramento District, Corps of Engineers, Sacramento, Calif.

12. Oakleaf, R.J. and D.A. Klebenow. 1975. Change in Avifauna Populations of the Lower Truckee River. Nevada Dept. Fish and Game, Spec. Rpt. Fed. Aid. Proj. W-53-R.

13. Ohmart, Robert D., W.D. Deacon and C. Burke. 1977. A Riparian Case History: The Colorado River. In: R. Roy Johnson and D.A. Jones. 1977. Importance Preservation and Management of Riparian Habitat: A Symposium. 1977. USDA Forest Service General Technical Report RM-43.

14. Nevada Department of Wildlife. 1982. Job Progress Report, Truckee River, January 1, 1982 through December 31, 1982. 17pp.

15. Piest, Linden A. 1982. Evaluation of Waterfowl Habitat Improvements in the Apache - Sitgreaves National Forest, Arizona, Masters Thesis. School of Renewable Natural Resources. University of Arizona, Tucson. 87pp.

16. Quigley, Thomas M. 1981. Estimating Contribution of Overstory Vegetation to Stream Surface Shade. Wildl. Svc. Bull. 9(1):22-27.

17. Reiser, D.W., and T.C. Bjornn. 1979. Influence of Forest and Rangeland Management on Anadromous Fish Habitat in Western North America: Habitat Requirements of Anodromous Salmonids. U.S. Dept. of Agriculture/Forest Service. General Technical Report PNW-96, October, 1979. 54pp.

18. Roberts, Warren G., J.G. Howe and J. Major. 1977. A Survey of Riparian Forest Flora and Fauna in California. In: Sands, Anne. 1977. Riparian Forests in California; Their Ecology and Conservation. Institute of Ecology Publication No. 15, University of Calif., Davis.

19. Rowell, J.H. 1975. Truckee River Temperature Prediction Study. U.S. Bureau of Reclamation, Sacramento, Calif. 56pp.

20. Thomas, Richard and A. Biaggi. 1981. Water Quality Data Steamboat Creek Intensive Survey Low Flow Conditions Feb. 23-25, 1981. Nevada Division of Environmental Protection, Carson City. 81pp.

21. Truckee Meadows Engineers, Inc. 1976. Preliminary Draft of the Environmental Impact Statement for the: Expansion of the Reno/Sparks Joint Wastewater Treatment Facility and Extension of the Cross-Town Sewer to Serve the Lawton-Verdi Area. City of Reno, Nevada.

22. Truckee Meadows Engineers, Inc. 1977. Draft Environmental Impact Statement and Environmental Impact Assessment for Reno/Sparks Joint Water Pollution Control Plant, Cross-Town Sewer and Lawton-Verdi Interceptor Extension. City of Reno, Nevada.

23. U.S. Bureau of Land Management. 1982. Draft Reno Grazing Environmental Impact Statement. BLM District Office, Carson City, Nevada.

24. U.S. Environmental Protection Agency. 1980. Draft Environmental Impact Statement; Reno/Sparks Joint Water Pollution Control Plant Master Project. EPA Region IX, San Francisco, CA.

25. U.S. Fish and Wildlife Service. 1977. Classification of Wetlands and Deep-Water Habitats: An Operational Draft.

26. U.S. Fish and Wildlife Service. 1979. Restoration of a Reproductive Population of Lahontan Cutthroat Trout (Salmo clarki henshawi) to the Truckee River/Pyramid Lake System. Draft Special Report. Reno, NV. 131 pp.

27. U.S. Fish and Wildlife Service and U.S. Bureau of Census. 1982. 1980 National Survey on Hunting, Fishing and Wildlife-Associated Recreation. Fish and Wildlife Service, Washington, D.C. 156 pp.

28. U.S. Fish and Wildlife Service. 1982. Sensitive Bird Species. Fish and Wildlife Service, Portland, Oregon.

29. Washoe Council of Governments. 1978. Water Quality Management Plan, Washoe County, Nevada. Washoe Council of Governments, Reno, Nevada.

30. Wood, Richard D. 1977. Truckee River Corridor and Open Space Study. City of Sparks.

APPENDIX

United States Department of the Interior

FISH AND WILDLIFE SERVICE
GREAT BASIN COMPLEX OFFICE
4600 Kietzke Lane - Bldg. C
Reno, Nevada 89502-5093

April 12, 1983

Mr. Harvey R. Nelson, Jr.
Projects Manager
Bureau of Reclamation
Lahontan Basin Projects Office
P.O. Box 640
Carson City, NV 89701

Dear Mr. Nelson:

We are preparing a Fish and Wildlife Coordination Act Report on the Sacramento District Corps of Engineers' Truckee Meadows Investigation. Current Corps' plans include reconstruction of three to five water intake structures within Truckee Meadows. Under the Washoe Project Act the Bureau of Reclamation is already authorized to construct fish screens throughout this area. In most instances this would also involve reconstruction of water intake structures. There is a possibility that the Corps' project may precede and to some extent duplicate actions authorized in the Washoe Project Act. Through a cooperative effort it may be possible for the Corps to reconstruct these diversion structures to accept fish screens which would be installed at a later date by the Bureau of Reclamation.

If you agree this is a practical approach and you are willing to participate, please write the Corps, attention Allan Oto, Project Engineer, and send a copy to this office. We would like to include your response in the draft Fish and Wildlife Coordination Act report which we plan to finalize by the first of May.

Sincerely,

Donald J. King
Complex Manager

cc:
Nevada Department of Wildlife, Reno, Fallon

United States Department of the Interior
BUREAU OF RECLAMATION
LAHONTAN BASIN PROJECTS OFFICE
P. O. BOX 640
CARSON CITY, NEVADA 89702

IN REPLY
REFER TO:

MAY 13 1983

District Engineer
Corps of Engineers
Attention: Allan Oto
650 Capitol Mall
P. O. Box 1739
Sacramento, California 95814

Ladies and Gentlemen:

The Fish and Wildlife Service has informed us that Corps of Engineers' plans for the Truckee Meadows include reconstruction of three to five water intake structures along this reach of the Truckee River. The Service is interested in fish screen installation where necessary at such structures on the Truckee. Washoe Project authorization and plans provide for facilities to permit restoration of Pyramid Lake fishery. Fish screens have been included among restoration facilities considered by the Bureau of Reclamation for the Truckee River. However, a firm decision as to whether or where fish screens are to be installed has not been made. We expect the decision to be made in the course of cooperative research and planning being performed by the Fish and Wildlife Service and the Bureau of Reclamation for Pyramid Lake fishery restoration. The studies are associated with negotiations underway concerning the fishery and other Truckee/Carson water problems.

The Service has suggested that coordination between Reclamation and the Corps of Engineers' plans for the Truckee Meadows turnout structures might avert wasteful duplication of structure modification. We agree that, if the Corps planned to reconstruct the structures before such time as Reclamation is ready to install fish screens, it would be wise for our agencies jointly to consider structures that would accommodate later fish screen installation. This is contingent, of course, on the eventual decision regarding fish screens.

We would appreciate information from you concerning your plans and anticipated schedule for reconstruction of the Truckee Meadows turn-

out structures. If it develops that a cooperative effort between the Corps and Reclamation on these structures would be helpful to a fish screen project, and workable, we would like to discuss it with you at an appropriate time.

Sincerely,

R. A. Whitney

for Harvey R. Nelson, Jr.,
Projects Manager

Copy to: Donald J. King, Complex Manager
U.S. Fish and Wildlife Service
Attention: Bob Hallock
4600 Kietzke Lane, Bldg. C
Reno, Nevada 89502

United States Department of the Interior

FISH AND WILDLIFE SERVICE
GREAT BASIN COMPLEX OFFICE
4600 Kietzke Lane - Bldg. C
Reno, Nevada 89502-5093

March 3, 1983

Mr. Bruce McDonald
Senior Park Planner
Washoe County Parks
P.O. Box 11130
Reno, NV 89520

Dear Mr. McDonald:

The U.S. Fish and Wildlife Service has been evaluating environment feasibility of the Army Corps of Engineer's Truckee Meadows Investigation for flood control through Reno and Sparks. We are seeking approval of a tentative enhancement recommendation to revegetate approximately 9.5 acres along 8,333 feet of Steamboat Creek between Pembroke Drive and the Truckee River for recreation, migratory birds, water quality control and threatened and endangered species. This area would not be protected by the proposed flood control project, but it would be covered under a flowage easement. The remaining 4,876 feet of Steamboat Creek is presently being considered as a mitigation recommendation which would be handled as a separate aspect of the flood control project.

Our Central Office would appreciate certain information prior to acting on our recommendation. As soon as conveniently possible, I would appreciate your agency's views on the following question:

> If recommendations result in 9.5 acres of wetland revegetation provided on a nonreimbursable cost basis under the Federal Water Project Recreation Act (PL 89-72) would your agency desire to administer these lands?

The principal advantages of revegetating this area are:

1. Recreation. Revegetation of this area with cottonwood would complement a proposed bicycle path along Steamboat Creek. Also, our analysis of the project indicates there will be a demand for wildlife observation in Truckee Meadows which will not be met with existing wildlife habitats.

2. Water Quality. Water temperatures become marginal to unacceptable for most desirable fish present in Steamboat Creek and the lower Truckee River during exceptionally low flow periods in the summer and fall. We believe that a stand of cottonwood trees along Steamboat Creek will improve water quality by lowering summer and fall water temperatures in Steamboat Creek and the Lower Truckee River.

3. Fish and Wildlife Enhancement. Riparian habitats are essential to many migratory nongame birds. Most estimates for arid portions of the west indicate that only about 10 percent of the original riparian forests remain. Losses of vegetation along the Truckee River appear consistent with the estimates. Consequently, we feel that any addition of this habitat type will promote migratory birds. The improved water quality expected from this proposal should aid in the recovery of the endangered cui-ui (Chasmistes cujus) and threatened Lahontan cutthroat trout (Salmo clarki henshawi) and other game fish in the lower Truckee River and Steamboat Creek.

Administration of the enhancement area would require assumption of the operation and maintenance costs. Although involved in the land transfer, our agency would be associated with the project to the extent of being assured that the three principal objectives were being accomplished.

Please consider this a request for a definite commitment. However, the formal letter of intent and general agreement, if your agency decides to participate, would be solicited by the Army Corps of Engineers at a later date. If you or your staff need additional information, please contact Bob Hallock at this office, telephone 784-5227.

Sincerely,

Robert J Hallock

for Donald J. King
Complex Manager

cc:
Army Corps of Engineers, Sacramento
Nevada Department of Wildlife Reno, Fallon
Washoe County, Reno
Washoe Council of Governments, Reno

WASHOE COUNTY

"To Protect and To Serve"

DEPARTMENT OF PARKS & RECREATION

2601 PLUMAS STREET
POST OFFICE BOX 11130
RENO, NEVADA 89520
PHONE: (702) 785-6133

April 22, 1983

Mr. Donald J. King, Complex Manager
United States Department of the Interior
Fish and Wildlife Service
4600 Kietzke Lane, Bldg. C
Reno, Nevada 89502-5093

RECEIVED
APR 26 1983
FAO-RENO

Dear Mr. King:

This letter is in response to your March 3, 1983 letter concerning Washoe County's involvement in the Army Corps of Engineers Truckee Meadows Flood Control Investigation.

It is our understanding that your agency is seeking approval of a tentative enhancement recommendation to revegetate approximately 9.5 acres along 8,333 feet of Steamboat Creek between Pembroke Drive and the Truckee River.

The Washoe County Parks Department favors your proposal, particularly in view of the recreation, water quality, and wildlife enhancement that would result. It also seems logical that our department should ultimately administer the aforementioned property.

In conclusion, we can safely state that it is our intent to participate with both your agency as well as the Corps of Engineers on the implementation of the aforementioned plan. However, it would not be appropriate for Washoe County to make a commitment without knowing the time frame for this project. I am sure you are aware of the extremely tight fiscal constraints that Washoe County government faces for the next few years. Given this fact, we would appreciate any additional information that is available concerning project review period, final approval, proposed construction and completion dates, and land transfer date. This will allow us to better plan for assumption of operation and maintenance costs for a specific fiscal year.

We appreciate having the opportunity to review your proposal, and look forward to continuing involvement in this project.

Sincerely,

C. BRUCE McDONALD
SENIOR PARK PLANNER

cc: Gene Sullivan, Director of Parks
Nevada Department of Wildlife
Marcia Gydell, Army Corps of Engineers, Sacramento

WASHOE COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER

United States Department of the Interior

FISH AND WILDLIFE SERVICE
GREAT BASIN COMPLEX OFFICE
4600 Kietzke Lane - Bldg. C
Reno, Nevada 89502-5093

March 3, 1983

Mr. Duke Lindeman
Parks and Recreation Director
City of Reno
P.O. Box 1900
Reno, NV 89505

Dear Mr. Lindeman:

The U.S. Fish and Wildlife Service has been evaluating environmental feasibility of the Army Corps of Engineer's Truckee Meadows Investigation for flood control through Reno and Sparks. We are now seeking approval of a tentative recommendation to develop an area of approximately 300 wetland acres for recreation, migratory birds, water quality control and threatened and endangered fish. It could become an enhancement feature of the flood control project. The area under consideration is west of Hidden Valley and south of Pembroke Drive. It includes the confluence of Steamboat Creek and Boynton Slough, the existing marsh on Steamboat Creek and the lower reach of Boynton Slough. This area would not be protected by the proposed flood control project, but it would be covered under a flowage easement.

Our Central Office would appreciate certain information prior to acting on our recommendation. As soon as conveniently possible I would appreciate your agency's views on the following question:

> If recommendations result in a 300 acre wetland enhancement area provided on a nonreimbursable cost basis under the Federal Water Project Recreation Act (PL. 89-72), would your agency desire to administer these lands?

The principal advantages of developing this area as a wetland are:

1. Recreation. This area would provide recreation as a wetland park and interpretive center. Our analysis of the project indicates there will be a demand for wildlife observation in Truckee Meadows which will not be met with existing wildlife habitats. Emergent wetlands support a unique array of wildlife which may become essentially eliminated from Truckee Meadows. Because of the substantial difference in vegetation, this area would complement the Doyle Island riparian wetland.

2. Water Quality. Nevada Division of Environmental Protection has documented the water purifying abilities of the existing ± 55 acre wetland on

Steamboat Creek. The use of this area, including Boynton Slough, for nonpoint source water pollution control from a large portion of Truckee Meadows is recommended in the Washoe County 208 Water Quality Management Plan. Leonard Crowe, Washoe Council of Governments, has pointed out that approximately 40 acres of open water sedimentation ponds would be needed to handle both streams. In addition to this, we feel that approximately 120 acres of perennial emergent vegetation would be adequate to extract nutrients under existing conditions and attract wildlife. The proportion of perennial emergent vegetation would be increased as development in south Truckee Meadows continues. Participation in this 208 Plan was a Special Grant Condition for the Early Start Project at the wastewater treatment facility.

3. Fish and Wildlife Enhancement. The area now supports the last sizable emergent wetland in Truckee Meadows. Wetlands are very important for waterfowl and other migratory birds. Since the turn of the century we have lost the majority (in excess of 100,000 acres) of the wetlands in western Nevada. This area is now considered a weak link for some species in the Western Flyway. The improved water quality expected from this proposal should aid in the recovery of the endangered cui-ui (Chasmistes cujus) and threatened Lahontan cutthroat trout (Salmo clarki henshawi) and other game fish in the lower Truckee River and Steamboat Creek.

Administration of the enhancement area would require assumption of the operation and maintenance costs. Costs would involve maintenance of sedimentation ponds, dikes to control water levels supportive of emergent recreation and recreational facilities. Although involved in the land transfer, our agency would be associated with the project to the extent of being assured that the three principal objectives were being accomplished.

Please consider this a request for a definite commitment. However, the formal letter of intent and general agreement, if your agency decides to participate, would be solicited by the Army Corps of Engineers at a later date. If you or your staff need additional information, please contact Bob Hallock at this office, telephone 784-5227.

Sincerely,

for Donald J. King
Complex Manager

cc:
Army Corps of Engineers, Sacramento
Nevada Department of Wildlife Reno, Fallon
Washoe County, Reno
Washoe Council of Governments, Reno

City of Reno

POST OFFICE BOX 1900 • RENO, NEVADA 89505 • (702) 785-2000

7 March 1984

Mr. Bob Hallock
U.S. Department of Interior
Fish and Wildlife Service
Great Basin Complex Office
4600 Kietzke Lane - Building C
Reno, NV 89502-5093

Dear Mr. Hallock:

This is in response to your inquiry as to the feasibility of the City of Reno administering a 300± acre wetland area west of Hidden Valley and south of Pembroke Drive. At this juncture, and with so many indefinites connected with the project, it is not realistic to request a formal commitment from our City Council.

It is staff's recommendation that the City of Reno and Washoe County, and possibly City of Sparks, join in a commitment to the project. We are all faced with park lands maintenance demands that are above staff and funding capacities. It does not appear that a single entity could undertake a project of this magnitude. Joint participation may be the only solution.

Please keep me posted as to the progress of the project and/or advise me of the next steps required from the City of Reno.

Sincerely,

D. J. "Duke" Lindeman

D. J. "Duke" Lindeman
Parks and Recreation Director

DJL:jj

Attachment 4

Endangered Species Section 7 Biological Assessment and Biological Opinion

December 23, 1983

TRUCKEE MEADOWS INVESTIGATION

(RENO-SPARKS METROPOLITAN AREA), NEVADA

BIOLOGICAL ASSESSMENT

1. Introduction. - A biological assessment is required by Section 7(c) of the Endangered Species Act (16 USC 1533) for those listed and proposed endangered and threatened species which the Fish and Wildlife Service (FWS) advises may be present in the area of proposed construction work. On 11 August 1982, FWS advised that there are two listed fish species which may be present in the area of the Truckee Meadows Investigation: cui-ui (endangered) and Lahontan cutthroat trout (threatened).

Flood protection to the 100 year level by the selected plan would be provided primarily through bridge replacements, setback floodwalls, floodwalls, setback levees, channel excavation in four isolated areas, and an overflow water retention area.

The purpose of this biological assessment is to determine whether the listed endangered and threatened species are likely to be affected by construction of the selected plan.

2. Biological Data. - EDAW, Inc. (50 Green Street, San Francisco, CA 94111) compiled biological data on the listed and candidate species. The FWS Office of Endangered Species and the Nevada Department of Wildlife (NDW) provided comments on the draft Data Report on April 21, 1981 and January 26, 1981 and these comments were utilized in preparing the final report. Close coordination has been maintained with the Ecological Services element of the Fish and Wildlife Service and the Nevada Department of Wildlife pursuant to the Fish and Wildlife Coordination Act. Since the selected plan has been revised from that presented in the draft Data Report, the Final Data Report was revised by the Corps to reflect these changes. The Final Biological Data Report is provided as Attachment 1 and is hereby incorporated by reference. The data indicate that:

a. Although present downstream, there are no known populations of the endangered cui-ui within the construction area. There will be no changes in river hydrology or turbidity levels during or after construction, which would affect cui-ui or its habitat. Trees and other vegetation along 2.4 miles of the river will be removed for project construction. There will be a potential for up to a 1.6°F increase in water temperature at Lockwood while riparian trees planted for mitigation grow to effective height for shade. The smaller temperature rise expected within cui-ui habitat may, under critical conditions, cause further degradation to habitat quality.

b. There are populations of the threatened Lahontan cutthroat trout within and downstream of the construction area in the Truckee River. Although the area has recently been stocked, the NDW has no plans to restore, by natural reproduction, the cutthroat to their historic distribution. The

cutthroat trout's river bottom habitat will be impacted over a 6 year period from alteration and excavation for six bridge replacements, floodwall construction, and flood channel deepening in downtown Reno. The linear extent of this impact is 1 mile of the 11 miles within the study area. Turbidity will be controlled to State standards. As described above, water temperature increases above existing conditions would occur which will degrade cutthroat trout habitat quality. These temporary impacts are likely to adversely affect the threatened Lahontan cutthroat trout in the short term, but not over the long term as mitigation measures become effective.

3. Assessment. - I have concluded that the endangered cui-ui may be adversely affected in the short term by the selected plan for the Truckee Meadows Investigation. Additional post-authorization studies are planned to determine the significance of the impact. The proposed mitigation and enhancement measures will benefit the cui-ui.

I have concluded that there will be short-term adverse impacts to the threatened Lahontan cutthroat trout. I intend to include in the plans and specifications for construction appropriate provisions to avoid, to the extent possible, adverse impacts from construction activities and to mitigate unavoidable impacts.

Formal consultation and a biological opinion are being requested from the FWS on these potentially impacted species. I expect this process to identify the extent to which this construction project jeopardizes the continued existence of these species and the reasonable and prudent alternatives available to assist the Corps of Engineers to avoid jeopardy while proceeding with the project. If the post-authorization studies show significantly worse adverse effects to these species than presently predicted, the Corps will reinitiate consultation.

I have also determined that a potential exists to expand the range and improve the habitat for both these listed species in furtherance of the recovery plans. I intend to propose various enhancement measures where applicable as part of a project and supported by the sponsoring agencies as required by law.

1 Attachment
Endangered Species
Biological Data Report
dated November 1983

J. W. Cooper
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

United States
Department of the Interior

Fish and Wildlife Service
Lloyd 500 Building, Suite 1692
500 N.E. Multnomah Street
Portland, Oregon 97232

In Reply Refer To: AFA-SE Your Reference:

1-5-84-F-13

March 26, 1984

TO: District Engineer, Corps of Engineers, Sacramento, CA

FROM: Assistant Regional Director, Federal Assistance
Region 1, Portland, OR (AFA-SE)

SUBJECT: Endangered Species Act Formal Section 7 Consultation for the Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada, Draft Feasibility Report and Draft Environmental Impact Statement (1-5-84-F-13)

This responds to your December 29, 1983 request for formal consultation on actions proposed in the Truckee Meadows (Reno-Sparks Metropolitan Area), Nevada, Draft Feasibility Report and Draft Environmental Impact Statement which may affect the listed endangered cui-ui (Chasmistes cujus) and threatened Lahontan cutthroat trout (Salmo clarki henshawi).

We have reviewed the proposed project actions in accordance with the Section 7 Interagency Cooperation Regulations (50 CFR 402, 43 FR 870) and the Endangered Species Act of 1973, as amended. In February and March, 1984, we completed our review of the information you provided (Draft Feasibility Report and Environmental Impact Statement, Endangered Species Biological Data Report) as well as the Truckee Meadows Fish and Wildlife Coordination Act Report (Buchanan and Hallock 1984), and other pertinent information in our service file which provides the basis for writing this opinion.

Biological Opinion

It is the Biological Opinion of the Fish and Wildlife Service that actions proposed in the Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement are not likely to jeopardize the continued existence of the listed endangered cui-ui or threatened Lahontan cutthroat trout.

Project Description

The study area includes the Truckee River in the Reno-Sparks/Truckee Meadows area, Washoe County, Nevada. The draft Feasibility Report and Environmental Impact Statement (FREIS) was prepared in response to a Congressional resolution which directed the U.S. Army Corps of Engineers to analyze alternative methods of providing flood control to the Truckee Meadows area. Discussion and analysis within

the FREIS are restricted to a single plan which was selected after consideration of a total of twelve alternative plans. The selected channel-levee plan (CLP), Alternative 11, is a combination of bridge replacement, channel modification, floodwalls, levees, and an overflow water detention area, and is designed to provide 100-year flood protection for the Reno-Sparks/Truckee Meadows area. The following description of the proposed project is taken from the Endangered Species Biological Data Report prepared by the Sacramento District, U.S. Army Corps of Engineers.

Floodwalls and setback floodwalls would be constructed or reconstructed along the north bank between Booth and Lake Streets, and between Washington and Lake Streets on the south bank. Bridges would be reconstructed and replaced at or above grade at Arlington Avenue, Booth, Virginia, Lake, Sierra, and Center Streets. The foot bridges at Wingfield Park would also be elevated.

Channel excavation is proposed along the north bank in the vicinity of Booth Street Bridge, and within the stream channel to a maximum depth of 1.5 feet from just above Arlington Avenue Bridge to just above Sierra Street Bridge. The total river distance involved is approximately 1,600 feet.

Setback floodwalls are planned for the south bank from Kietzke Lane to Glendale Avenue; both setback floodwalls and setback levees would be constructed between Glendale Avenue and South Rock Boulevard along both banks. Additionally, the North Truckee Drain diversion dam just above Glendale Avenue would be reconstructed and realigned.

Between South Rock Boulevard and South McCarran Boulevard there would be setback floodwalls, floodwalls at the river's edge, and setback levees. In the area of Glendale Park, 5.6 acres of river bed along the north bank would be excavated.

Between South McCarran Boulevard and the east end of the project at Vista, setback levees would be built on both sides of the river. These levees would be approximately 11 feet high and 82 to 90 feet wide at the base. Immediately east of the University Farm's building on South McCarran Boulevard, a 700 foot overflow weir would be built and approximately 7 acres excavated from the south bank of the Truckee River adjacent to agricultural land. The University Farms area would be surrounded by 10 foot levees and serve as a detention area to temporarily store peak flows of floods greater than a 35-year event. This is intended to preclude increased flood peaks for areas downstream of the project. An overflow weir and low level outlet structure would be located along the east side to release flows back into the Truckee River.

Levees with an average height of 10.5 feet would be constructed along Steamboat Creek and Boynton Slough. Pembroke Drive Bridge over Steamboat Creek will be raised and lengthened to provide for more flow under the bridge.

Project features have been designed to allow for controlled overtopping when the design capacity has been exceeded. Controlled overtopping will prevent levee failure and route excess flood waters to the same areas they would go to without the project. Also, interior drainage provisions are included to evacuate excess ponding behind protective works.

Species Accounts

Lahontan cutthroat trout

The Lahontan cutthroat trout, Salmo clarki henshawi, is one subspecies of a wide-ranging species that includes at least 14 recognized forms in the western United States. Cutthroat trout have the most extensive range of any inland trout species of western North American and occur in anadromous, non-anadromous, fluvial, and lacustrine populations (Behnke 1979). Many of the basins in which cutthroat trout occur contain remnants of much more extensive bodies of water that were present during the wetter period of the late Pleistocene epoch (Smith 1978).

Differentiation of the species into 14 or so recognized subspecies has occurred during subsequent general dessication of the Great Basin and Intermountain Region since the end of the Pleistocene, and indicates presence of cutthroat trout in most of their historic range prior to the last major Pleistocene glaciation (Behnke 1981; Loudenslager and Gall 1980). Ancestral Lahontan cutthroat trout (LCT) probably invaded the pluvial Lake Lahontan system over 25,000 years ago (Gerstung 1981; Coffin 1981), although the precise events of entry and origin of the original stock are unclear (Behnke 1979, 1981; Loudenslager and Gall 1980).

Lahontan cutthroat trout historically occurred in most cold waters of the Lahontan Basin of Nevada and California, including the Humboldt, Truckee, Carson, Walker, and Summit Lake/Quinn River drainages. Large alkaline lakes, small mountain streams and lakes, small tributary streams, and major rivers were inhabited, resulting in the present highly-variable subspecies. The fish occurred in Tahoe, Pyramid, Winnemucca, Summit, Donner, Walker, and Independence Lakes, but disappeared from the type locality, Lake Tahoe, about 1940 due primarily to blockage of spawning tributaries, and subsequently from Pyramid and Walker Lakes (Behnke 1979).

Significant diversion of Truckee River flows began with the completion of Derby Dam in 1905. As the Pyramid Lake level dropped, the river mouth became increasingly sand-choked. After 1930, passage of cutthroat trout into the Truckee River was essentially blocked. The last spawning run of any consequence was in 1929-30. Additionally, resident cutthroat populations in the Truckee River mainstream were eliminated in the 1920's due to competition and introgressive hybridization with introduced rainbow trout, and decreasing water quantity and quality (La Rivers 1962). Obligate stream spawners, LCT historically migrated into the upper reaches of the Truckee to spawn, but were restricted to the lower 38 miles of the river following completion of Derby Dam.

Most populations of Lahontan cutthroat trout throughout historic range have been extirpated because of severe human-caused habitat alterations and/or the introduction of predatory, competing, or hybridizing species of non-native fishes. According to Gerstung (1981), LCT presently occupy only 0.3% of historic lake habitat and less than 10% of historic stream habitat.

Since disappearance of the Pyramid Lake cutthroat trout strain, LCT have been stocked into Pyramid Lake since the 1950's (U.S. Department of Interior 1983a). Since their reintroduction, and through 1975, adult LCT could migrate from Pyramid Lake into the Truckee River only when river flows were sufficiently high to allow passage over the delta at the river's mouth (Ringo 1975). With completion of Marble Bluff Dam and Fishway in 1976, migrating LCT could access the lower river, but were blocked by Derby Dam (river kilometer 64) from further upstream movement.

The Nevada Department of Wildlife (NDOW) presently stocks 8"-10" rainbow and brown trout into the Truckee River of which 75% are stocked in the Reno/Sparks city limits (NDOW 1982). In addition, in 1982 and 1983, several thousand LCT were released into the Truckee and are now appearing in fishermen's catches. Because of current political, economic, environmental, etc. constraints, it is the consensus of professional biologists in both NDOW and FWS that establishment of a self-sustaining LCT population in the mainstream river upstream of Derby Dam is infeasible at present. However, establishment of such a population in Pyramid Lake and the lower Truckee River is feasible, and would represent a major step toward recovery of the species in the Truckee/Tahoe basin as outlined in the draft LCT Recovery Plan (U.S. Department of Interior 1983b).

LCT spawning runs into the Truckee River from Pyramid Lake historically consisted of two seasonally-distinct migrations (La Rivers 1962), one from late fall-March and the other from April-June. Present-day Truckee River water quality and quantity severly limit the possibility of consistent spring spawning runs. However, the river below Derby Dam does offer the potential for at least occasional spring spawning during abnormally cold and/or high water years, and fall/winter spawning during most years.

Cui-ui

Cui-ui, Chasmistes cujus, are endemic to Pyramid Lake, Nevada. They are obligatory stream-spawners, and adults congregate each spring in the south end of Pyramid Lake near the Truckee River mouth prior to their migration up the Truckee River. According to Sonnevil (1981), the size of the prespawning aggregation is directly related to the volume of river flow at that time. Historically, cui-ui spawned throughout the lower 45 miles of the river from April-May (Snyder 1917). As was the case for Lahontan cutthroat trout, construction of Derby Dam in 1905-1906 prevented further upstream movement. More importantly, diversions at the dam significantly reduced river flows downstream. As a result the level of Pyramid Lake dropped and the delta which formed at the river mouth during the 1930's draught severely inhibited fish access from Pyramid Lake (La Rivers 1962). Since then, cui-ui have been able to spawn only in years when stream flow was high enough to permit passage over the delta (Scoppettone et al 1983). In 1967, because of population decline, the cui-ui was listed as endangered (Pyle et al. 1977).

Beginning in 1973, hatchery-reared cui-ui fry have been annually stocked into Pyramid Lake. In the period 1973-76, for example, nearly 7.5 million fry were distributed into the lower Truckee River, and Pyramid Lake (Pyle et al. 1977), and up to 13 million fry were annually stocked in subsequent years (Scoppettone et al. 1983). Completion of Marble Bluff Fishway in 1975 was predicted to be of major importance in restoration of both cui-ui and Lahontan cutthroat trout. However, the fishway design was patterned after northwestern U.S. salmonid passage facilities, and cui-ui did not use the fishway in 1976 or 1977. After modifications to the fishway to reduce water velocity and turbulence, approximately 5,000 cui-ui utilized the facility in 1980 (Sonnevil 1981). In 1981, a low-runoff year, only 200 fish used the fishway. In 1982 and 1983, high-runoff years, numbers of cui-ui using the fishway each year were 14,000 and 6,000, respectively (Scoppettone et al. 1983).

In 1981, a 3-year research program was initiated to obtain information identified in the Cui-ui Recovery Plan as needed to restore population stability and allow delisting of the species. Research efforts were directed toward obtaining data on pre-spawning adult migration, fecundity of females, preferred spawning habitat, egg viability, emigration of larvae, size and age structure of the adult population, and effectiveness of the fishway for fish passage (Scoppettone et al. 1983). Results to date indicate that even in high water years such as 1982 and 1983, only a small fraction of the reproductive population used the fishway. Additionally, age structure of the cui-ui population appears very unstable. One year class, 1969, apparently composed 92% of the 1983 prespawning aggregate, and 97% of the fish which actually traversed the fishway. Eventual loss of this age class can be expected to cause a dramatic decline in the cui-ui population from which it may not recover.

Length of cui-ui reproductive life is not known definitively, but indications are that older fish (1950 year class and earlier) are now senescent, and that maximum egg viability is 25-30 years. However, male cui-ui apparently do not live as long as do females (Scoppettone et al. 1983). Thus the 1969 year class (14 yrs. old in 1984) has no more than 10-15 years of reproductive viability remaining, based on current knowledge. Though comparatively good spawning runs have occurred in most years since 1979, length of time required to reach spawning age (6-7 years) and lack of any life history information on the first 6 years or so, prohibit documentation of any recruitment back into the spawning population until 1986 or 1987 when 1980 progeny should begin appearing in the reproductive population.

Analysis of Impacts

The floodwalls, excavations, and levees will remove 2.4 miles (22.9 acres) of riparioan vegetation, which amounts to an equivalent of 1.32 miles of full-time shade (U.S. Army Corps of Enigneers 1983). Shading from streamside vegetation canopy strongly influences water temperature. Any changes which allow for increased solar radiation, including reduction in vegetation height and/or density, increased stream width, and increased distance of vegetation from the stream, will cause a corresponding increase in water temperatures (Quigley 1981, Reiser and Bjornn 1979). Maximum accumulated temperature increase in the area resulting from project activities is estimated to be 1.6 F at the downstream terminus of the project boundary. This potential increase would occur only during low-flow periods in the warmest months, June-August, until riparian vegetation planted for mitigation grows to heights sufficient to provide shade (estimated 10-15 years). Expected long-term lowering of water temperatures compared with pre-project levels should improve this particular water quality parameter for both cui-ui and LCT, as would cotton-wood revegetation along Steamboat Creek as proposed in the Truckee Meadows Coordination Act Report (Buchanan and Hallock 1984).

Alterations in streambed from channel excavation, and turbidity/sedimentation from dredge and fill operation have the potential to locally impact LCT. However, assurances by CE to utilize appropriate and necessary sediment control measures to comply with state standards for turbidity should preclude any measurable impacts. Excavation of the riverbed would most likely leave the existing fish ladders inoperable in the vicinity of Wingfield Park. Placing of large boulders in channel areas, as proposed in the Truckee Meadows Fish and Wildlife Coordination Act Report (Buchanan and Hallock 1984), would enhance habitat for LCT. We foresee no effects of these activities on cui-ui habitat downstream.

Existing wetlands at the lower end of Steamboat Creek and Boynton Slough are thought to be positively affecting water quality, especially with respect to removal of sediment, phosphorous, and nitrogen (Thomas and Biaggi 1981). The

addition of phosphorous and nitrogen into the lower Truckee River and Pyramid Lake has been identified as one of the most potentially detrimental water quality problems with respect to cui-ui and Lahontan cutthroat trout. Test incubations of LCT eggs in lower Truckee River gravels show consistently high mortality, primarily due to low intra-gravel dissolved oxygen concentrations. Nutrient biostimulation of periphyton and vascular aquatic plants has been identified as a likely cause of such low oxygen levels (Galat 1982; US Department of Interior 1983c). Present continuing controversy over construction of the Reno-Sparks Advanced Wastewater Treatment Plan centers, in part, on the need to control nutrient inputs to the Truckee River. Existing wetlands could undoubtedly be enhanced to further contribute to nutrient and sediment control.

Biological Opinion

It is the Biological Opinion of the Fish and Wildlife Service that actions proposed in the Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement are not likely to jeopardize the continued existence of the listed endangered cui-ui and threatened Lahontan cutthroat trout.

Incidental Take

Section 9 of ESA prohibits any taking (harm, harrassment, mortality, etc.) of listed species without special exemption. Under the terms of Section 7(b)(4)iii and 7(0)2, taking that is incidental to and not intended as a part of the agency action (in this case during channel excavation) is not considered taking within the bounds of the Act, provided that such taking is in compliance with terms and conditions of this Biological Opinion. We hereby establish such terms and conditions on incidental take: 1) if any individuals of any of the listed species discussed in this Opinion is killed as a result of the subject project, the Corps of Engineers, Sacramento, shall require that the causitive action of such taking cease immediately, and shall reinitiate formal consultation and/or seek authorization under Section 10(a)(1)(B) prior to proceeding with the action; 2) no additional requirements need be implemented by the C.O.E. to minimize incidental take since the probability for incidental take is almost nill; 3) all dead or injured individuals shall be retrieved and turned over to the Nevada Department of Wildlife immediately; and, 4) C.O.E. shall immediately telephone the Great Basin Complex Office in Reno if incidental take occurs, and prepare a written report which shall include the date, location, and circumstances surrounding the taking and the depositions of the individual(s) taken. Written and telephone reports should be directed to Dr. Randy M. McNatt at our Great Basin Complex Office in Reno (702) 784-5227 or FTS 470-5227.

Additional Conservation Measures

In furtherance of the purposes of the 1973 Endangered Species Act, as amended, and to promote the conservation of listed and candiate species, we offer the following recommendations to the proposed action. These recommendations hold no legal stature but are suggestions which, if incorporated into the project, will beneficially affect the respective organisms.

1. Revegetate areas along the Truckee River and Steamboat Creek, as identified in the Truckee Meadows Fish and Wildlife Coordination Act Report, to improve water temperature conditions.

2. Insure, via purchase or easement, the continued integrity of the Steamboat Creek wetland and lower Boynton Slough to provide for control of non-point source pollution. Possible improvements to the area, including additional open-water ponds and emergent vegetation areas to enhance control of sedimentation, heavy metals, and nutrients, should be implemented.

This concludes formal consultation on the Truckee Meadows Draft Feasibility Report and Draft Environmental Impact Statement. Consultation should be reinitiated if project actions, as they would affect listed species, differ from those presented in the proposed project (including mitigation and compensation), or if additional species in the project area become listed. If you have any questions concerning this consultation and Biological Opinion, please contact Dr. Randy M. McNatt at our Great Basin Complex Office in Reno (702) 784-5227 or FTS 470-5227.

William F. Shake

References

Behnke, R.J. 1979. Monographs of the native trouts of the genus Salmo of western North America. Dept. of Int:, Bureau of Land Management, U.S. Fish and Wildlife Serv., Region 6, Denver, Col.

Behnke, R.J. 1981. Systematic and zoogeographical interpretation of Great Basin trouts. In R.J. Naiman and D.L. Soltz (Eds). Fishes in North American Deserts. Wiley-interscience, John Wiley & Sons. New York. 552 pp.

Buchanan, Chester, C. and R.J. Hallock. 1984. Fish and Wildlife Coordination Act Report, Truckee Meadows Investigation. US Fish & Wildlife Service, Reno, NV. 44 pp.

Galat, D. 1982. Study concepts paper--sewage effluent in the lower Truckee River and Pyramid Lake: toxicity to fish and biostimulation to aquatic plants. Colo. Coop. Fishery Research Unit, Ft. Collins. 56 pp.

Gerstung, E.R. 1981. The status and management of the Lahontan cutthroat trout (Salmo clarki henshawi, Snyder). Nev. Dept. Wildl. Reno, NV. 18 pp.

Loudenslager, E.J. and G.A.E. Gall. 1980. Geographic patterns of protein variation and subspeciation in cutthroat trout, Salmo clarki. Syst. Zool. 29:27-42.

La Rivers, I. 1962. Fishes and Fisheries of Nevada. Nevada St. Fish & Game Comm., Carson City, NV. 782 pp.

Nevada Department of Wildlife. 1982. Job Progress Report Truckee River, January 1, 1982 through December 31, 1982. 17 pp.

Pyle, E., J. Frazier, D. King, K. Johnson, D. Lockhard, and T. Trelease. 1977 Cui-ui recovery plan. US Fish & Wildlife Service, End. Species Program, Reg. 1, Portland, OR. 38 pp.

Quigley, T.M. 1981. Estimating contribution of overstory vegetation to stream surface shade. Wildlife Service Bull. 9(1):22-27.

Reiser, D.W. and T.C. Bjornn. Influence of forest and rangeland management on anadromous fish habitat in western North America: habitat requirements of anadromous salmonids. US Dept. of Agriculture/Forest Service, Gen. Tech. Rept. PNW-96, October 1979. 54 pp.

Ringo, R.D. 1975. A survey of Truckee River fish passage problems with emphasis on Lahontan cutthroat trout. US Fish and Wildlife Service, Reno, NV.

Scoppettone, G., G. Wedemeyer, M. Coleman, and H. Burge, 1983. Life history information on the endangered cui-ui (Chasmistes cujus); annual report--FY1983. National Fish. Research Center, Seattle, WA, and Great Basin Complex Off. Reno, NV. 45 pp.

Smith, G.R. 1978. Biogeography of intermountain fishes. Great Basin Nat. Mem. 2:17-42.

Snyder, J.O. 1917. The fishes of the Lahontan system of Nevada and northeastern California, Bulletin of the United States Bureau of Fisheries, Vol. 35, for 1915-16, doc. no. 843, pp. 33-86, figs 1-9, pls 3-5.

Sonnevil, G.M. 1981. Evaluation of the cui-ui restoration program: 1977-1980. Unpubl. rept. U.S. Fish & Wildlife Serv., Fish. Assist. Off., Reno, Nevada. 25 pp.

Thomas, R. and A. Biaggi. 1981. Water quality data, Steamboat Creek intensive survey low flow conditions, Feb. 23-25, 1981. Nevada Division of Environmental Protection, Carson City. 81 pp.

U.S. Army Corps of Engineers. 1983. Truckee Meadows Investigation endangered species biological data report. Sacramento, CA. 35 pp.

U.S. Department of Interior. 1983a. Restoration of a reproductive population of Lahontan cutthroat trout (Salmo clarki henshawi) to the Truckee River/Pyramid Lake system. U.S. Fish & Wildlife Service, Great Basin Complex Office, Reno, NV. 232 pp.

U.S. Department of Interior. 1983b. Lahontan cutthroat trout recovery plan, technical review draft. May 1, 1983. US Fish and Wildlife Service, Portland, OR. 52 pp.

U.S. Department of Interior. 1983c. Survival of Lahontan cutthroat trout eggs relative to water quality in the Truckee River, west-central Nevada and eastern California. US Geological Survey, Open File Report 83-xxx. Carson City. 45 pp.

Attachment 5

U.S. Fish and Wildlife Service Planning Aid Letter of Environmental Impacts Relative to North Truckee Drain/Peoples Drain Project Features

United States Department of the Interior

FISH AND WILDLIFE SERVICE

GREAT BASIN COMPLEX
4600 Kietzke Lane, Building C
Reno, Nevada 89502

December 21, 1984

Colonel Arthur E. Williams
District Engineer
U.S. Army Corps of Engineers
650 Capitol Mall
Sacramento, CA 95814

Dear Colonel Williams:

This is a supplement to the April 1984 report by the Fish and Wildlife Service on the Truckee Meadows Investigation (Reno/Sparks Metropolitan Area), Nevada. It is a detailed report of the impacts on fish and wildlife associated with the proposed construction of backwater levees in and along the North Truckee and Peoples Drains in the east end of Sparks, Washoe County, Nevada. This supplemental report has been prepared under the authority of the Fish and Wildlife Coordination Act, P.L. 85-624 Section 2(b) and is in keeping with the spirit and intent of the National Environment Policy Act.

The Truckee Meadows Investigation Feasibility Report is being prepared by the Army Corps of Engineers (Corps) in response to a February 7, 1964, resolution by the Committee on Public Works of the United States Senate. The Service has been consulted throughout the planning process and has had input in selecting the recommended alternative considered in this document.

The Service evaluated the resources and project impacts based on local and regional habitat scarcity, vulnerability to changes, replaceability through management actions, habitat quality, feasibility for compensating unavoidable resource losses, and a project life of 50 years (1990-2040). The goals of the Service in this study are: (1) to evaluate the impact of the proposed plan on fish and wildlife populations, their habitat and their utilization by the public throughout the entire planning area, (2) to recommend methods of mitigating unavoidable fish and wildlife habitat losses, (3) to recommend methods of enhancing fish and wildlife habitat where feasible.

The Service's findings are based on project descriptions and data provided by Project Engineer, Allan Oto, through December 19, 1984. Detailed descriptions of the overall planning area and biological resources are found in our Coordination Act Report of April 1984 and will not be repeated here.

As part of the above-mentioned project a series of backwater levees are planned for the lower 6,900 feet of the North Truckee Drain and lower 4,000 feet of the Peoples Drain. Vegetation acreages were quantified from aerial photographs and field observations with your staff. These areas support about 0.65 and 1.7 acres of riparian wetland vegetation respectively for a total of 2.35 acres. Irregular patches of willow (Salix species) dominate this vegetation, but there are a few cottonwood.

This vegetation supports many of the migratory bird species identified in the April 1984 Coordination Act Report. An extremely important secondary function of this vegetation is cooling of waters passing into the Truckee River. Seasonally, high water temperature is a recognized problem for threatened Lahontan cutthroat trout (Salmo clarki henshawi), endangered cui-ui (Chasmistes cujus), and game fish in the lower Truckee River. At this time Stampede Reservoir is used almost exclusively to control water temperatures for the benefit of these listed fish. High summer water temperature is believed to be a limiting factor for game fish which are not regularly found in these drains.

There are 2.4 acres and 1.1 acres of open water habitat in the North Truckee and Peoples Drain, respectively. Water in the North Truckee Drain includes irrigation returns from Spanish Springs Valley, urban runoff from east Sparks and storm waters. The Peoples Drain passes a small quantity of irrigation return and storm water and large quantities of water from the Helms Construction Company Gravel Pit. These waters tend to be high in nutrients and they support extensive plant growths in the summer.

Without the project we assume that existing plans for a linear park would be completed along the entire study reach of the North Truckee Drain. The Peoples Drain would be maintained about as it is. The City of Sparks has an agreement to develop the Helms Gravel Pit as an aquatic park and the Peoples Drain would continue to handle discharge from that area along with storm waters and urban runoff. Average discharge would be reduced in the Peoples Drain.

With linear park we assume that the riparian habitat (0.65 acres) will be maintained or possibly enhanced because multiple canopies would be created. Wildlife habitat along the Peoples Drain will remain but with more industrial encroachment on the south side. It is assumed that this drain would be cleaned by dredging once during the next 56 years. This will result in an annual average acreage slightly less than existing conditions. Assuming a ten percent loss to encroachment and a ten-year-recovery period for willows the annual average acreage along the Peoples Drain would be reduced from 1.7 to 1.55 acres. The total annual average riparian acreage for both drains would be 2.2 acres without the project.

Open water habitats will remain constant at 3.5 acres.

Very little human use now occurs along these drains. Use should increase as the City of Sparks completes its wetland park/bicycle path plan. Human use of the fish populations in the lower Truckee River would continue to be depressed because of unnaturally high summer water temperatures.

With the project, about 75 percent of the riparian vegetation along the North Truckee Drain and all of the vegetation along the Peoples Drain would be removed while constructing backwater levees during a six-year period.

A 75 percent vegetative loss is assumed for the construction period. The majority of this vegetation is willow, and it should be reestablished in about ten years, and a 50 percent loss is assumed for this period. During the next 40 years it is assumed that the Peoples Drain would be dredged once similar to conditions without the project. Under these conditions, average annual acreage with the project would be about 1.96 acres. Thus, the net loss of riparian vegetation with the project would be about 0.24 acres. In addition to a small loss in migratory bird habitat this represents another increment of temperature degradation for sport and listed fish in the lower Truckee River.

Open water habitat would remain unchanged with the project.

With the project, very little human use of the study area should occur. However, use should increase as the City of Sparks completes its wetland park/bicycle path plan. Human use of fish resources in the lower Truckee River would be diminished slightly by this proposed project.

Mitigation of this small riparian vegetation loss may be accomplished in place by (1) grading and planting the North Truckee Drain to resemble the existing wetland park on this same drain above this project and (2) by planting and maintaining one row of cottonwood, on 25-foot centers, along the south bank of the Peoples Drain. About 160 trees would be involved along the Peoples Drain. These measures should restore wildlife habitat and preclude elevated water temperature in the dtrain waters and ultimately the lower Truckee River. Human use in the study area would be increased.

As enhancement, we recommend additional plantings along the North Truckee Drain to provide 100 percent canopy cover. About 135 additional trees should accomplish this objective. This would improve aquatic habitat in both the drains and the lower Truckee River and associated human uses.

Sincerely,

Acting Complex Manager

cc: Nevada Department of Wildlife, Reno and Fallon, Nevada