



AMISTAD DAM AND RESERVOIR PROJECT

**ON THE RIO GRANDE
NEAR DEL RIO, TEXAS -
CIUDAD ACUÑA, COAHUILA**

**A JOINT PROJECT
OF
THE UNITED STATES AND MEXICO**

**UNDER THE SUPERVISION OF
THE INTERNATIONAL BOUNDARY
AND WATER COMMISSION**

AMISTAD DAM AND RESERVOIR

Amistad Dam, located on the Rio Grande, twelve miles upstream from Del Rio, Texas-Ciudad Acuna, Coahuila, is the second major international storage dam to be constructed jointly by the United States and Mexico, pursuant to the Water Treaty of 1944. The first, Falcon Dam, located about 294 miles downstream from the Amistad site, was completed in 1953.

Agreement with Mexico for joint construction of Amistad Dam by the Governments of the United States and of Mexico, in accordance with the provisions of the Water Treaty of 1944, was authorized by the Congress of the United States in Public Law 86-605, July 7, 1960.

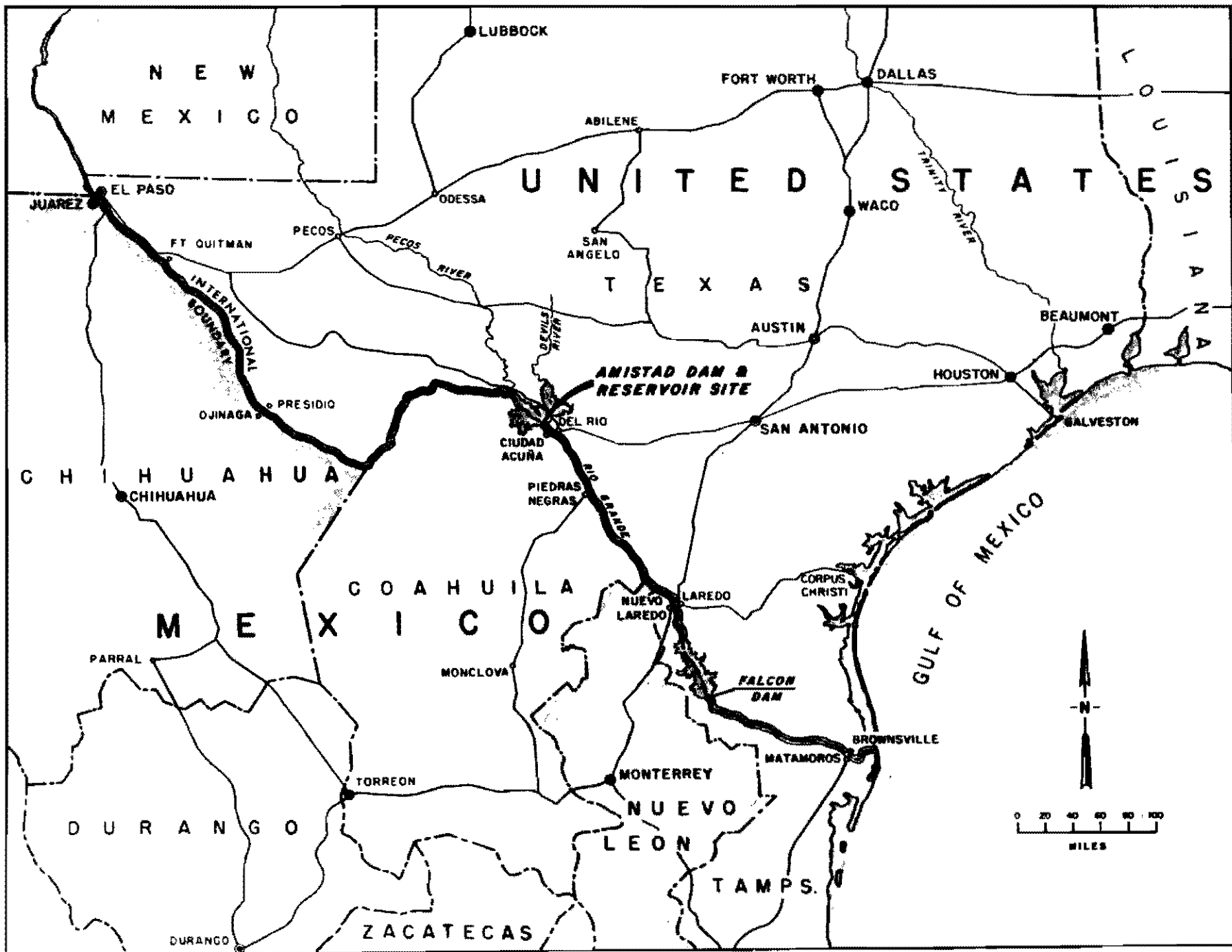
Construction of Amistad Dam is being performed by the two Governments through their respective Sections of the International Boundary and Water Commission, United States and Mexico.

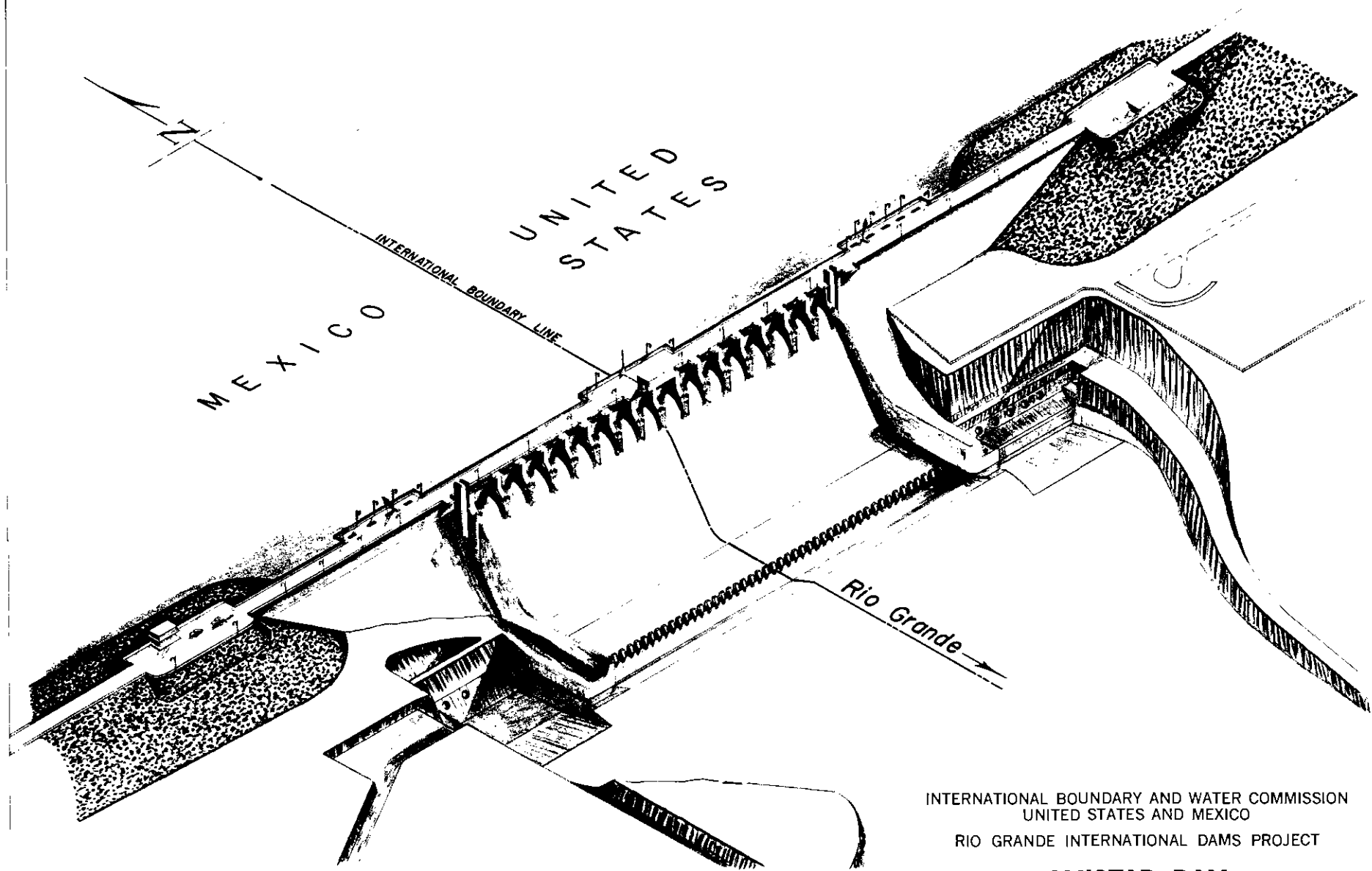
Amistad Dam, in conjunction with Falcon Dam, will achieve the purpose set forth in the Treaty of providing for the conservation, storage, and regulation of the greatest quantity of the annual flow of the Rio Grande in a way to ensure continuance of

existing uses and the development of the greatest number of feasible projects within the limits imposed by the water allotments specified to each country.

The dam will prevent loss of life and great property damage in both countries such as occurred from the floods in 1954 and 1958. The dam is designed to control, to the safe downstream channel capacity, the maximum flood of record originating above the dam site. Incident to releases of water for domestic and irrigation uses, Amistad Dam will have an energy generation potential of 323,000,000 kilowatt hours annually to be divided equally between the two countries in accordance with the Treaty.

In addition to its primary function of flood control, water conservation, and power generation, the Amistad Reservoir will bring new recreational opportunities to the surrounding area. The reservoir will extend up the Rio Grande approximately 74 miles at conservation level, forming a fresh-water lake well suited to recreation and conveniently located with respect to numerous cities and communities, both in the United States and Mexico, to make it an international recreational area.





INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

RIO GRANDE INTERNATIONAL DAMS PROJECT

AMISTAD DAM

THE DAM

The crest of the dam will be 254 feet above the river bed. The dam will be 6.06 miles long, consisting of a 2,182-foot-long concrete gravity section in the river channel flanked by 1.61 miles of embankment on

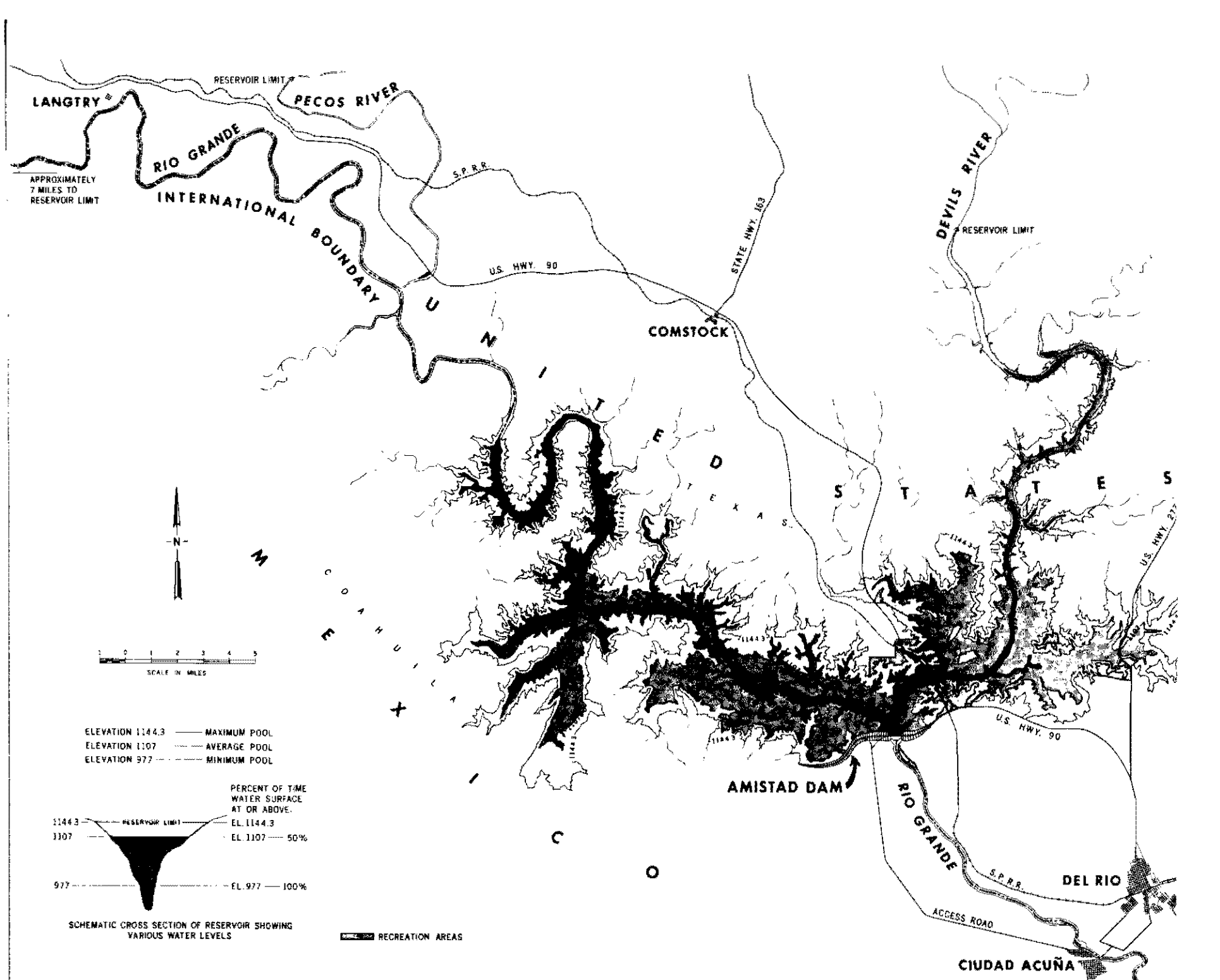
the United States side and 4.04 miles of embankment on the Mexican side. The concrete gravity section will contain a spillway 950 feet in length with its crest at Elevation 1086.4.

THE RESERVOIR

At maximum water surface elevation, the Amistad Reservoir water surface area will be approximately 138 square miles, extending about 86 miles up the Río Grande. In volume Amistad Reservoir will rank 20th among the largest reservoirs in North America. Incremental reservoir capacities and corresponding surface areas are as follows:

	<u>Water Surface Elevation Feet</u>	<u>Reservoir Area Acres</u>	<u>Accumu- lated Capacity Acre-Feet</u>
Silt Storage	1,035.0	13,600	550,000
Conservation Storage	1,117.0	67,000	3,550,000
Flood Storage	1,140.4	84,000	5,325,000
Superstorage	1,144.3	88,200	5,660,000

In order to facilitate control of the international reservoir by the authorities of the two countries, a series of monuments will be constructed within the reservoir area to provide a jurisdictional boundary line. These monuments, which will be surmounted by platforms equipped with lights for nighttime identification and aviation warning, will consist of reinforced concrete shafts about 131 feet high which will extend above the maximum reservoir water surface.



LANGTRY
APPROXIMATELY
7 MILES TO
RESERVOIR LIMIT

RESERVOIR LIMIT

PECOS RIVER

RIO GRANDE

INTERNATIONAL BOUNDARY

S.P.R.R.

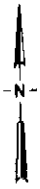
U.S. HWY. 90

STATE HWY. 163

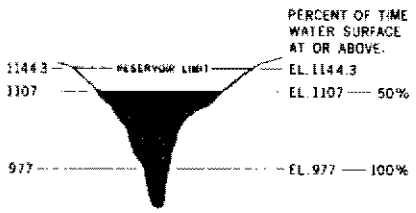
COMSTOCK

DEVILS RIVER

RESERVOIR LIMIT



ELEVATION 1144.3 ——— MAXIMUM POOL
ELEVATION 1107 ——— AVERAGE POOL
ELEVATION 977 ——— MINIMUM POOL



SCHEMATIC CROSS SECTION OF RESERVOIR SHOWING VARIOUS WATER LEVELS

RECREATION AREAS

AMISTAD DAM

RIO GRANDE

U.S. HWY. 90

S.P.R.R.

DEL RIO

ACCESS ROAD

CIUDAD ACUÑA

SITE SELECTION

Field surveys and geological investigations were started by the International Boundary and Water Commission in 1948 to locate the most suitable site for Amistad Dam. They extended through the Big Bend section of the Rio Grande from Santa Helena Canyon to below the mouth of the Devils River, a total distance of 320 miles. Some 45 prospective sites were studied, of which 13 were found to be entirely

feasible with respect to geologic and engineering considerations.

The Amistad site, located one mile below the confluence of the Devils River, was finally selected because of its strategic location below the confluences of the Pecos and the Devils Rivers, the sources of the highest floods on the Rio Grande.

PLANS

The site, capacities, and type of dam were recommended by the Commission in Minute dated June 19, 1958, and subsequently approved by the two Governments. Recommendations for construction of Amistad Dam, and the design and procedures, were recommended in Minutes dated January 12, 1961, and September 28, 1963, respectively, and soon thereafter approved by the two Governments.

The detailed plans and specifications for the dam

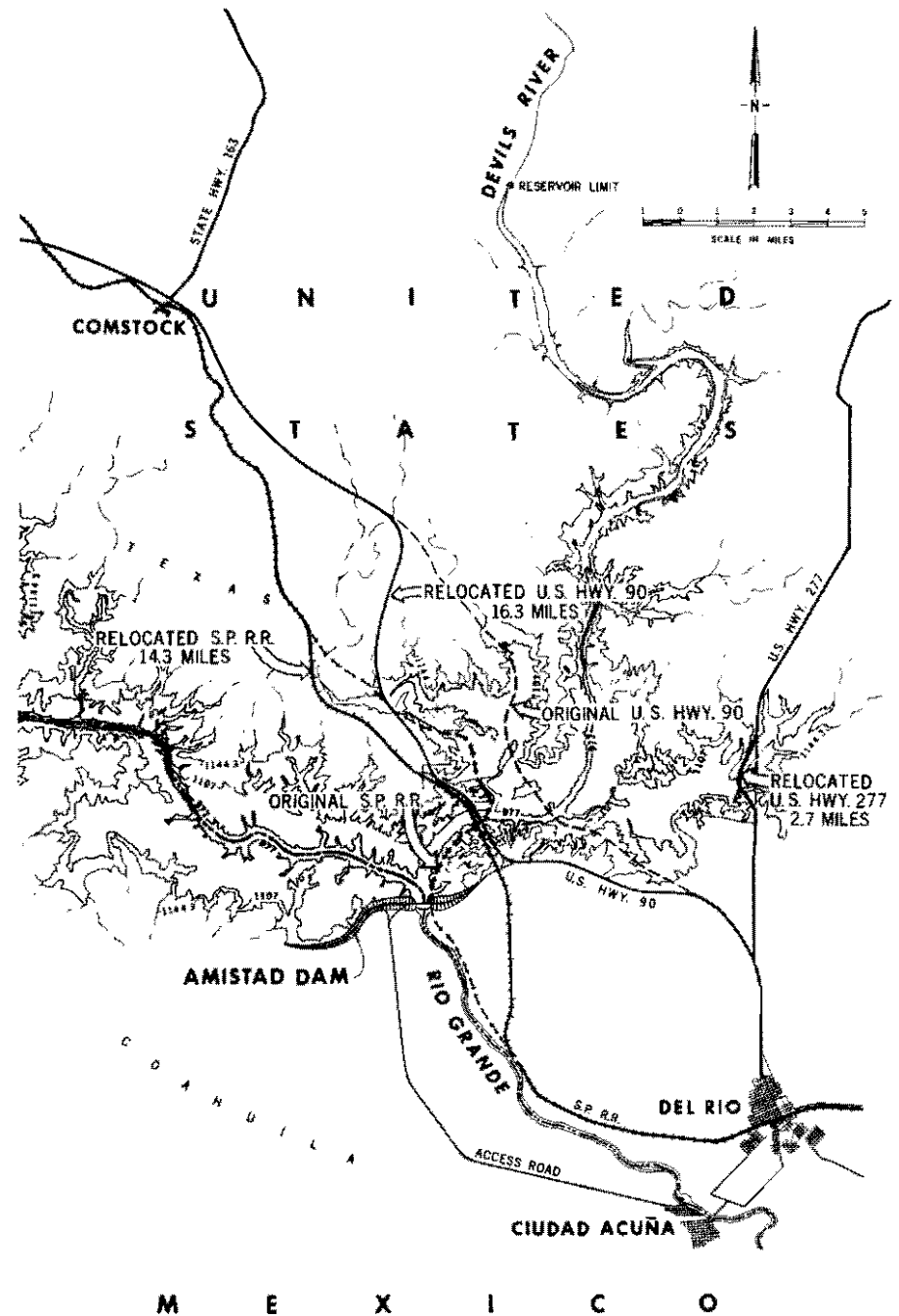
were jointly performed by the two Governments through the Commission. The design work was divided between the two Sections of the Commission and performed under mutually agreed-upon design criteria. The detailed plans and specifications assigned to the United States Section were performed under its supervision by the U. S. Army Engineer District, Fort Worth, Corps of Engineers. Those assigned to the Mexican Section were performed under its supervision by the Ministry of Hydraulic Resources, Mexico, D. F.

PROJECT LAND REQUIREMENTS

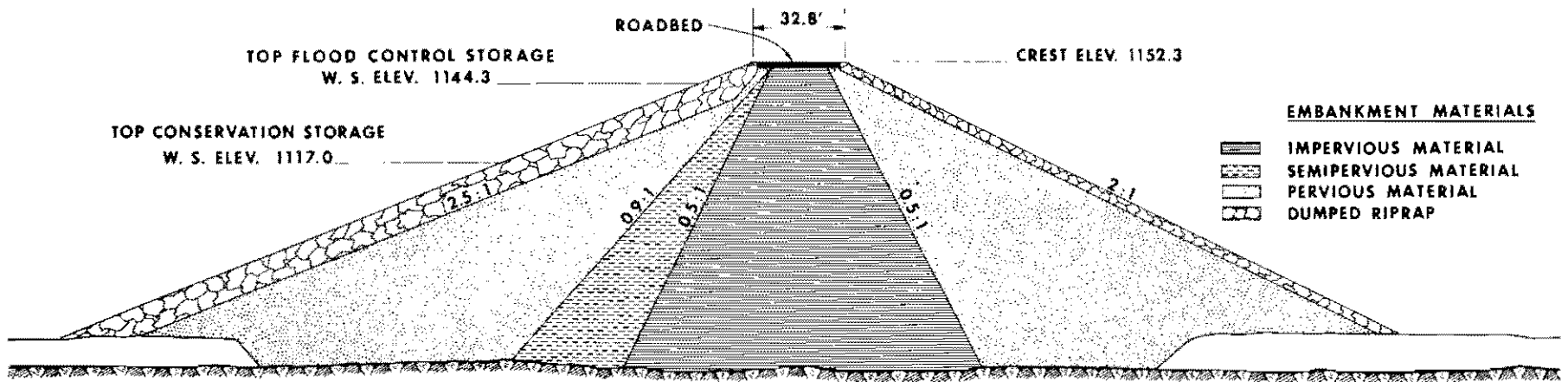
The Water Treaty of 1944 provides that each country shall acquire, at its own expense, all right-of-way required by the project on its side of the river boundary, and shall effect, at its own expense, all relocations of public and private utilities, and other properties necessitated by the project.

On the United States side the lands acquired to accommodate the dam and reservoir amount to 56,570 acres. Relocations required on the United States side consist of the construction of 14.3 miles of Southern Pacific Railroad track and 19.0 miles of U. S. Highways 90 and 277.

On the Mexican side the lands acquired for the dam and reservoir totaled 37,000 acres and an access road 15 miles in length was constructed from Ciudad Acuña to the dam site.



RELOCATIONS OF
S.P. R.R. AND HWYS. 90 & 277



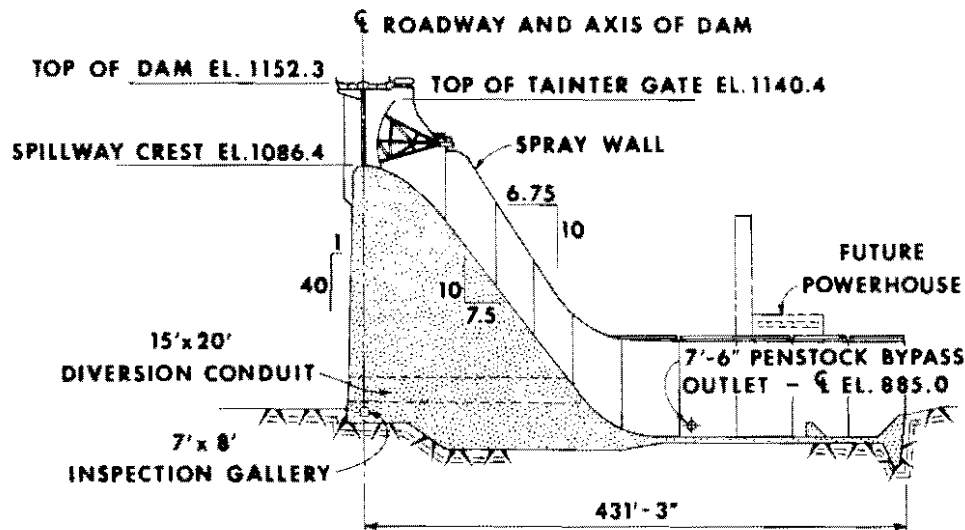
TYPICAL EMBANKMENT SECTION

THE EMBANKMENTS

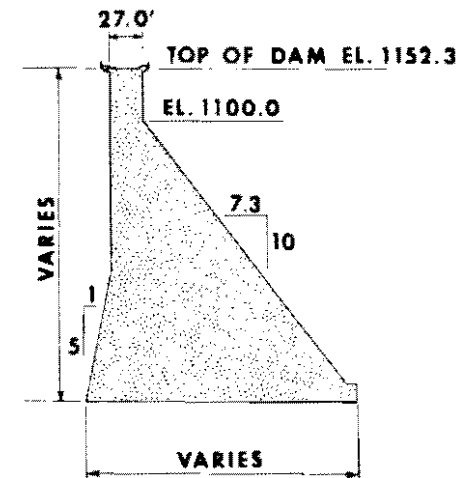
The embankment section will consist of an impervious core adjoined by a zone of semi-pervious material on the upstream side, which in turn will be bordered by a zone of free-draining material. The portion of the embankment on the downstream side of the core will consist entirely of pervious material. The upstream slope of the embankment will be 2.5 to 1 and the downstream slope will be 2 to 1. Both slopes will be paved with dumped riprap, 9.84 feet thick on the upstream slope, 3.28 feet thick on the downstream slope. The height of embankment will vary to a maximum of 115 feet. The total width of the embankment crown will be 32.8 feet. The two-lane asphalt-surfaced roadway throughout the length of the crest will have a metal guard rail along the downstream side and a

concrete curb, concrete sidewalk, and metal guard rail along the upstream side. Riprap will be obtained from rock excavation for the concrete section of the dam and adequate embankment materials are available from the borrow areas in close proximity of the work.

The first actual construction at the site began in August 1963 when the drilling and pressure grouting of the rock foundation was initiated to provide an impervious curtain beneath the earthfill sections of the dam, under contracts awarded by the United States Section and the Mexican Section of the Commission for work in their respective countries.



SECTION THRU SPILLWAY



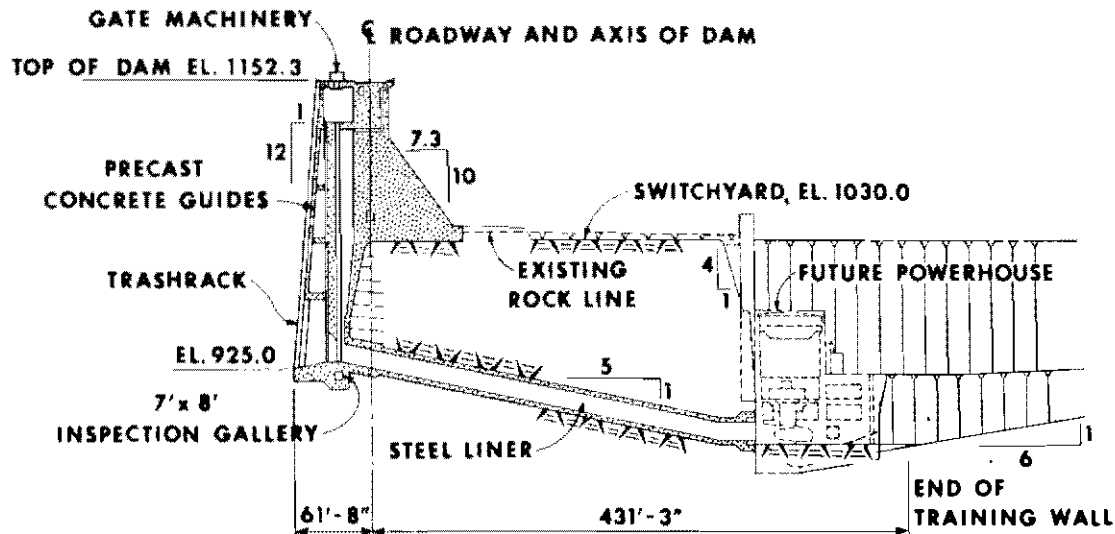
**TYPICAL
NON-OVERFLOW SECTION**

THE CONCRETE RIVER SECTION

The concrete gravity section of Amistad Dam will consist of a spillway located between non-overflow monoliths which include power intakes and transitions to the flanking earth embankments. The entire concrete section, 2,182 feet in length, will have a maximum height of 285 feet above the foundation.

a. The spillway will consist of seventeen monoliths, aggregating 1,034 feet in length, which will form sixteen spillway bays. Discharge over the crest will be controlled by sixteen Tainter gates 50 feet wide by 54 feet high. The maximum total discharge capacity of the spillway will be 1,543,000 cubic feet per second.

The shapes of the spillway crest, bucket curves, spray walls, and piers were determined by hydraulic analyses supplemented by model tests. A prestressed concrete girder bridge at deck elevation 1,152.3 feet supported on the piers between the gates will provide a two-lane roadway and sidewalks across the spillway. A wider section near the center of the spillway will provide an international monument and parking plaza. The roadway will be lighted by overhead expressway-type lamps. The international control house will be constructed on the downstream end of the center pier.



SECTION THRU U. S. POWER MONOLITH

b. *The stilling basin* will be of the horizontal-apron hydraulic-jump type 950 feet wide and 226.75 feet long with a single row of 47 baffle piers, each 12 feet high and 9 feet wide located 80 feet upstream from the downstream end of the stilling basin. The floor will be of reinforced concrete approximately 5 feet thick anchored into the limestone foundation. The downstream end still will be 18 feet high, 5 feet wide, and its upstream slope will be 1 to 1.

c. *The power intake* monoliths, penstocks, control

gates, and other appurtenances, including necessary excavations for power intake and tailrace channels, which are required for future development of power facilities by each country on its side of the dam, are included in the construction contract of each Government. The United States power intake will include five 14.5-foot-diameter penstocks, and the Mexican intake will include four 15.75-foot-diameter penstocks. Prior to installation of power facilities, irrigation releases will be made through the penstocks, modified for this purpose.

SHARING OF COST OF PROJECT

Division of Costs

Pursuant to the 1944 Treaty the cost of the dam is shared by the United States and Mexico in the same proportion as the conservation capacity of the reservoir is divided between the two countries, i.e., 56.2% to United States, 43.8% to Mexico. Each country will install, at its own expense, penstocks and other works required for future installation of its power plant.

The total costs of the dam are estimated to be approximately \$78,000,000, including costs of facilities needed in the dam for future power plants.

Each Government will separately install at its expense the powerhouse and hydroelectric generating units it requires in the areas planned for this purpose on each side of the dam, at such times in the future as each determines such installation to be feasible.

Other Project Costs

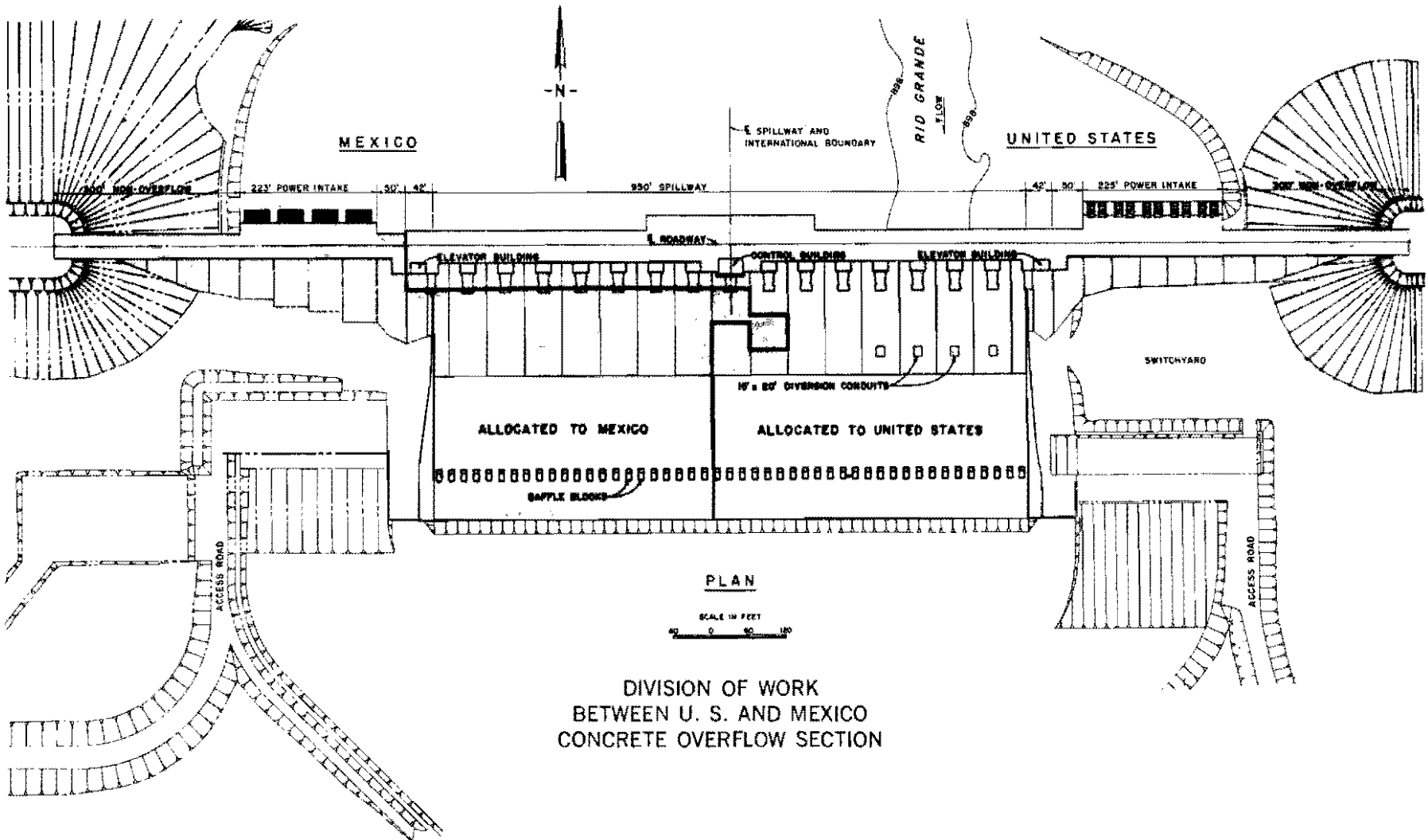
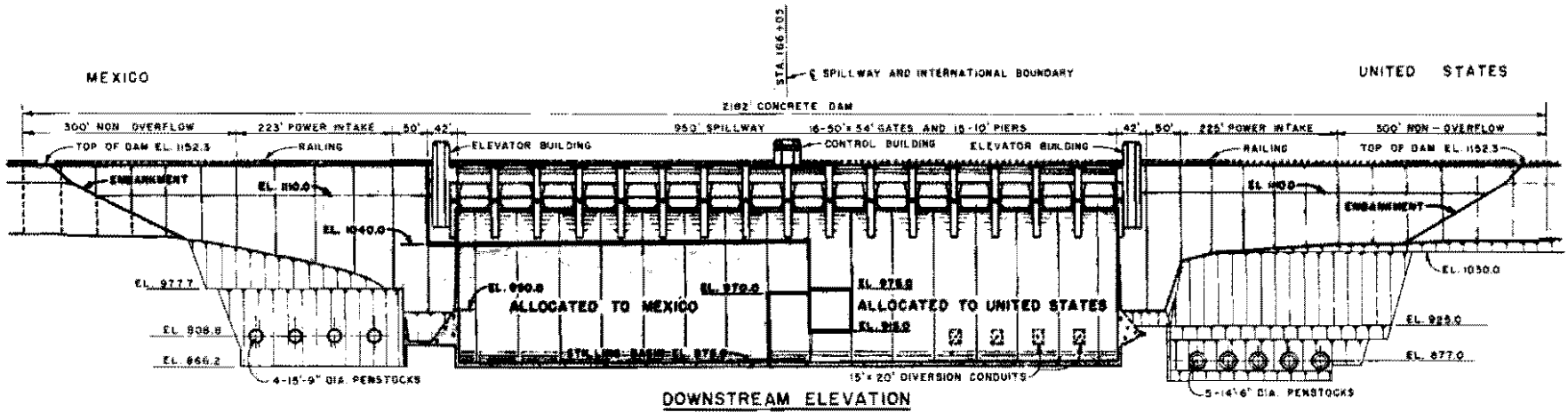
In addition to the cost of the lands required within its territory to accommodate the project, each country will bear the cost of appurtenant features within its territory, such as camps and access roads necessary for construction, and for future operation and maintenance of the project.

CONSTRUCTION

Construction of the dam is being divided between the two countries by allocating to each for performance, items of work the total estimated cost of which corresponds to its respective share of the cost of the dam. Construction work has been so divided that each country will construct certain features of the dam located within its territory consisting of the earth embankment section, the non-overflow monoliths in the concrete channel section, including penstocks and other facilities for future power plant installation. In addition, and in order to effect the proper division of work, the construction of the spillway and stilling basin will be shared by the two countries with the work divided approximately as shown on the following page.

Principal quantities of the work allocated to the United States are 6,000,000 cubic yards of earth embankment construction, 1,300,000 cubic yards of rock excavation, the placing of approximately 900,000 cubic yards of concrete, and the furnishing and installing of 10,000,000 pounds of structural steel, including the sixteen Tainter gates.

Principal quantities of the Mexican work are 7,500,000 cubic yards of earth embankment construction, 1,800,000 cubic yards of rock excavation, the placing of about 765,000 cubic yards of concrete, and the furnishing and installation of 3,000,000 pounds of structural steel.



DIVISION OF WORK
BETWEEN U. S. AND MEXICO
CONCRETE OVERFLOW SECTION

SCHEDULE OF CONSTRUCTION

Construction of the dam began in January 1965 and is scheduled for completion in March 1969. The various stages of construction have been so scheduled that the dam will have been raised to a sufficient height to permit impoundment of waters by the spring of 1968 prior to beginning of the flood season of that year. Construction by each Government is being performed by contract, with each advertising and letting its contract for work assigned to its country in accordance with its laws and regulations. The contractor for work assigned to the United States is a joint venture of four United States' firms, namely: Perini Corporation, Framington, Massachusetts, C. H.

Leavell & Co., El Paso, Texas, J. A. Jones Construction Co., Charlotte, North Carolina, and Vinnell Corporation, Alhambra, California. The contractor for the work assigned to Mexico is the firm, La Victoria y Asociados, S.A., Mexico, D. F.

The project is under the over-all supervision of the International Boundary and Water Commission, United States and Mexico. The United States contract is administered by United States Commissioner Joseph F. Friedkin, and the Mexican contract by Mexican Commissioner David Herrera Jordán.