

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

Ciudad Juárez, Chihuahua,
December 18, 1950.

MINUTE NO. 196

MODIFICATION OF THE ORIGINAL PLAN FOR THE
LOWER RIO GRANDE INTERNATIONAL FLOOD
CONTROL PROJECT.

The Commission met at the offices of the Mexican Section at Ciudad Juárez, Chihuahua, on December 18, 1950, at 11:00 a.m., for further consideration of modification of the original plan for the Lower Rio Grande International Flood Control Project.

The Commission, Principal Engineers and Technical Advisers had previously considered on several occasions the requirements in respect of modifications of the original plan for the project in the light of changes which have occurred in the hydraulic characteristics of the river since the plan was prepared in 1932 and other changes which will occur in the near future as the result of the Falcón Dam now under construction by the two Governments, as well as in the light of floods experienced since 1932 and knowledge of the hydraulic characteristics of the floodways. The Principal Engineers had been instructed to undertake a study and to submit a report for the consideration of the Commission regarding the modifications which should be made.

Pursuant to these instructions, there had been submitted to the Commission the "Joint Report of the Principal Engineers Recommending Modification of the Original Plan for the Lower Rio Grande International Flood Control Project", dated November 28, 1950, copies of the English

(Continued on Sheet No. 2)

COMISION INTERNACIONAL DE LIMITES Y AGUAS
ENTRE MEXICO Y ESTADOS UNIDOS

Ciudad Juárez, Chihuahua,
18 de diciembre de 1950.

ACTA NUM. 196

MODIFICACION AL PROYECTO ORIGINAL DEL
SISTEMA INTERNACIONAL DE DEFENSAS CONTRA
INUNDACIONES EN EL BAJO RIO BRAVO.

La Comisión se reunió en las oficinas de la Sección de México en Ciudad Juárez, Chihuahua, a las once horas del día 18 de diciembre de 1950, para estudiar una modificación al proyecto original del Sistema Internacional de Defensas Contra Inundaciones en el Bajo Río Bravo.

La Comisión, sus Ingenieros Principales y sus Asesores Técnicos habían tratado previamente, en varias ocasiones, acerca de la necesidad de hacer modificaciones al proyecto original del Sistema tomando en cuenta los cambios que han ocurrido en las características hidráulicas del río desde que se formuló el proyecto en 1932 y otros cambios que ocurrirán en un futuro próximo como resultado de la construcción de la Presa Falcón ya iniciada por los dos Gobiernos, y tomando en cuenta, también, las crecientes que han ocurrido desde 1932 y el conocimiento de las características hidráulicas de los cauces de alivio. Los Ingenieros Principales habían recibido instrucciones de emprender un estudio de este asunto y presentar a la Comisión un informe acerca de las modificaciones que deberían hacerse al proyecto.

Siguiendo estas instrucciones, se ha presentado a la Comisión el "Informe Común de los Ingenieros Principales Recomendando una Modificación al Proyecto Original del Sistema Internacional de Obras de Defensa contra Inundaciones en el Bajo Río Bravo", fechado el 28 de noviembre de 1950, cuyas copias en español

(Continúa en la Hoja No. 2)

(Continued from Sheet No. 1)

and Spanish texts of which are attached -- hereto as Exhibits 1 and 2, and form part hereof. -----

The Commission carefully reviewed the said Joint Report and agreed that it accurately describes the requirements and that the modifications of the original plan for the Lower Rio Grande International Flood Control Project proposed therein should be recommended for adoption by the two Governments. The Commission then adopted the following resolution: -----

"1. The 'Joint Report of the Principal Engineers Recommending Modification of the Original Plan for the Lower Rio Grande International Flood Control Project' dated November 28, 1950, is hereby approved by the Commission, subject to the approval of the two Governments. -----

"2. It is recommended that if the two Governments approve the modifications of the plan and the procedures proposed by the Principal Engineers for the completion of the Lower Rio Grande International Flood Control Project, the Commission be authorized to undertake as soon as practicable the construction of the Anzalduas Diversion Dam in accordance with the plans recommended therefor by the Principal Engineers, with such minor modifications as may be found by the Commission to be necessary or desirable for sound and expeditious construction and proper functioning of the structure, and that each Section of the Commission be authorized to undertake as soon as practicable such additional work as may be necessary within the territory of its own country to complete the Flood Control Project -----

(Continued on Sheet No. 3)

(Continúa de la Hoja No. 1)

y en inglés se agregan como Anexos 1 y 2 formando parte de esta Acta. -----

La Comisión revisó cuidadosamente dicho Informe Común y convino en que describe de una manera precisa la necesidad de las modificaciones y que las modificaciones al proyecto original del Sistema Internacional de Obras de Defensa contra Inundaciones propuestas en el mismo deberían recomendarse a los dos Gobiernos para su adopción. En seguida, la Comisión tomó la resolución siguiente: -----

"1. Se aprueba, sujeto a la aprobación de los dos Gobiernos, el 'Informe Común de los Ingenieros Principales Recomendando una Modificación al Proyecto original del Sistema Internacional de Obras de Defensa contra Inundaciones en el Bajo Río Bravo' fechado el 28 de noviembre de 1950. -----

"2. Se recomienda que si los dos Gobiernos aprueban las modificaciones al proyecto y los procedimientos propuestos por los Ingenieros Principales para completar el Sistema Internacional de Obras de Defensa contra Inundaciones en el Bajo Río Bravo, se autorice a la Comisión para que emprenda, tan pronto como sea práctico, la construcción de la Presa de Derivación Anzalduas, de acuerdo con los diseños recomendados por los Ingenieros Principales, haciendo en los mismos las ligeras modificaciones que la Comisión considere necesarias o deseables para lograr una construcción correcta y expedita y un funcionamiento apropiado de la estructura, y que cada Sección de la Comisión sea autorizada para emprender, tan pronto como sea viable, los trabajos adicionales que se consideren necesarios dentro del territorio de su propio país para completar el Sistema de Obras de Defensa -----

(Continúa en la Hoja No. 3)

(Continued from Sheet No. 2)

in accordance with the modified plans -
proposed by the Principal Engineers." -

The meeting then adjourned. -----

L. M. Lawson.

Commissioner of the United States

W. Herrera

Commissioner of Mexico

George Winters.

Secretary of the United States Section

Fernando Ruiz S.

Secretary of the Mexican Section

(Continúa de la Hoja No. 2)

de acuerdo con los planos modificados -
propuestos por los Ingenieros Princi-
pales." -----

Se levantó la sesión. -----

W. Herrera

Comisionado de México

L. M. Lawson.

Comisionado de los Estados Unidos

Fernando Ruiz S.

Secretario de la Sección de México

George Winters.

Secretario de la Sección de los Estados
Unidos

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

El Paso, Texas
November 28, 1950

JOINT REPORT OF THE PRINCIPAL ENGINEERS
RECOMMENDING MODIFICATION OF THE ORIGINAL PLAN FOR THE
LOWER RIO GRANDE INTERNATIONAL FLOOD CONTROL PROJECT

The Honorable Commissioners,
International Boundary and Water Commission,
United States and Mexico,
El Paso, Texas, and Ciudad Juárez, Chihuahua.

Sirs:

Pursuant to your instructions, we submit the following report recommending modification of the original plan for the Lower Rio Grande International Flood Control Project. This report sets out the features of the Flood Control Project, the necessity of construction of a flood diversion dam, and the criteria for its operation as a principal feature of the project; and recommends the construction of such a dam, the site therefor, and the general plan to be adopted.

Acting under instructions received from their respective Governments, the then International Boundary Commissioners prepared, under date of September 3, 1932, their joint "Preliminary Report on Flood Control Plans - Lower Rio Grande".

This report contemplated the construction or establishment of interior floodways within both countries, the building of levees along both sides of the Rio Grande to form a river floodway, and the construction of two diversion dams to permit the diversion of floodwaters into the various floodways in such a manner as to limit the flow in the river
channel

channel at Brownsville-Matamoras to not more than 30,000 second-feet with each country taking part of the excess floodwaters through its interior floodways.

The plan contemplated a design flood of about 187,000 second-feet in the Rio Grande at Peñitas, of which about 107,000 second-feet would be diverted into the United States floodways by means of a diversion dam tentatively recommended for construction in the river immediately below the Mission Inlet of the United States floodway. The remaining 80,000 second-feet was to be carried in the river channel to the second proposed diversion dam which was recommended for construction at a point opposite Dorna, Texas, and Colombres, Tamaulipas, where 45,000 second-feet was to be diverted into Mexican floodways. Of the remaining 35,000 second-feet, 5,000 second-feet was to be diverted into the United States Rancho Viejo Floodway just above Brownsville and 30,000 second-feet allowed to go on down the river to the Gulf. When floods occurred of 80,000 second-feet or less at Peñitas, the excess above 35,000 second-feet was to be diverted at the second proposed diversion dam either into United States floodways or into Mexican floodways or into both, as determined by the Commission, and the remaining 35,000 second-feet passing that dam was to be taken care of as heretofore stated.

Immediate construction of the floodways and river levees was approved by both Governments. However, the Government of Mexico stated that it was unable to approve construction and operation of the proposed diversion structures

structures pending an agreement regarding the division of waters between the two countries. The Treaty of February 3, 1944, constitutes that agreement. Since 1932 both Sections of the Commission have been engaged in the construction of the other elements of the project and the levees along the river and the interior floodways have been largely completed. It is apparent, however, that the provisions contained in the original plan for diversion of floodwaters should now be modified in the light of changes which have occurred in the hydraulic characteristics of the river and others which are to be anticipated in the near future, as well as in the light of the floods experienced since 1932 and knowledge of the hydraulic characteristics of the floodways.

The operation of the Marte R. Gómez Dam and Reservoir on the Río San Juan has changed, and the operation of the proposed Falcón Dam and Reservoir on the Rio Grande will further change, the characteristics of the flood flows reaching the head of the Lower Rio Grande Flood Control Project, by decreasing the frequency of floods of most of the various sizes considered, including the design flood of 187,000 second-feet, and by increasing the duration of the smaller-size floods, especially those up to 60,000 second-feet. Since floods of 60,000 second-feet or less will have a much greater frequency than floods in excess of that amount, the division of future floods between the two countries will be inequitable when measured by the frequency of floodway use unless a portion of floods up to 60,000 second-feet is diverted into the Mission Inlet of the United States floodway. This can be accomplished only by the construction of a diversion dam to divert waters into that floodway, as was contemplated in
the original

the original plan.

The modified plan recommended herein omits the dam originally proposed for construction at Donna-Colombres and the Rancho Viejo Floodway, revises the distribution of flood flows in the retained floodways, and provides for the construction of a single diversion dam at the Anzaldúas site, a short distance downstream from the Mission Inlet to the United States floodway as shown on the "Location Map - Anzaldúas Diversion Dam and Related Features", attached hereto as Exhibit No. 1. Studies by both Sections of the Commission and their Technical Consultants have shown that a dam of the nature proposed for construction at this site would afford the necessary means to regulate the diversion of floodwaters in such manner as to provide an equitable division from the standpoint of frequency of use of floodways of the two countries.

As in the case of the original plan, the modified plan is based upon a design flood of 187,000 second-feet although a flood of such magnitude may be expected to occur but rarely after Falcón Dam and Reservoir is placed in operation. However, under the modified plan 90,000 and 22,000 second-feet, respectively, would be diverted into the Mission and Hackney Lake inlets of the United States floodway, leaving 75,000 second-feet in the river at the Hidalgo-Reynosa Bridge. Of this 75,000 second-feet, about 45,000 second-feet would be diverted into Mexico's floodways above Brownsville-Matamoros and the remaining 30,000 would flow on down the river to the Gulf of Mexico.

Studies

Studies relative to flood stages in the river under the existing conditions have been made to develop the stage-discharge-relationship curves in the river at points opposite the entrances to the Mission and Hackney Lake inlets to the United States floodway. These studies indicate that to permit the desired division of the floodwaters between the two countries the Anzaldúas Diversion Dam should have control gates with crest elevation at 106.00 feet. The division of floodwaters between the river and the United States floodway, with the gates of the dam closed, partly open, and completely open, is graphically shown in Exhibit No. 2, "Anzaldúas Diversion Dam, Discharge Curves with Gates Opened and Closed". This exhibit shows the quantities of floodwater diverted to the Mission and Hackney Lake inlets for discharges up to 200,000 second-feet which might occur in the river upstream from the Mission Inlet through the coincidence of spills from the Falcón or Marte R. Gómez Reservoir, or both, with flood run-off of the Rio Grande below Falcón. The exhibit also shows the headwater elevation above the dam for the various conditions of river discharge and floodway diversion. This exhibit shows the divisions between the two countries of the 60,000 second-foot flood obtainable by opening the gates varying amounts.

The modified plan will utilize all levee and floodway works already constructed in both countries. However, studies show that in addition to the dam, other construction work will be required in each country, including the construction of any required protective works upstream from the Anzaldúas
Dam,

Dam, improvement of some of the floodways, including their entrances, and possibly also the building of new and the strengthening of existing levees.

While the Anzaldúas Dam herein proposed is recommended for joint construction by the two Governments solely on the basis of the necessity of diverting floodwaters, our studies show that without additional cost of construction of the dam it could also be utilized in connection with the diversion of irrigation waters to either country or to both, if so desired. Our studies show further that a water surface elevation of 103.51 feet would be required for such irrigation diversion and that the structure can be constructed and operated to provide this irrigation diversion water surface elevation without serious interference with developments in either country.

Several axis lines for the diversion dam in the Anzaldúas location have been investigated, and we have concluded that axis line No. 1, whose location is shown in Exhibit No. 3, "Anzaldúas Diversion Dam - Location and General Plan" hereto attached, should be adopted. Axis line No. 1 is situated approximately five miles above the Hidalgo-Reynosa Bridge. Foundation conditions have been investigated by means of core drillings which show that the dam will be founded on relatively hard sandstone.

A preliminary drawing, "Anzaldúas Diversion Dam - Plan and Sections", is shown in Exhibit No. 4. The dam is a concrete structure founded on sandstone with the gate sill located 1 foot above the present river bottom, and
with

with training dikes on both ends of the structure. The structure will be 640 feet between abutments and 140 feet in length along the river. Control is furnished by four roller gates, each 15 feet in diameter, with a 6-foot lip, and 100 feet long. The crest of the roller gates in a closed position will be at elevation 106.00. The total travel of the roller gates from closed to fully open position is 32.15 feet, and in fully open position the gates will clear the maximum high water surface by 5 feet. Immediately adjacent to the main gate on each side is a roller sluice gate 75 feet in length. A service bridge with 12-foot roadway is provided along the downstream part of the piers. Hoist houses are provided on the piers on which the machinery for raising the roller gates will be installed. The stilling basin below the gates is designed so that the hydraulic jump will be contained within the basin even under the most adverse condition which is assumed to be that with one gate partially open and with headwater at the top of the other three gates. Below the stilling basin 70 feet of riprap paving will be installed in the river channel section. The plan of the dam is such that either country may readily install irrigation diversion facilities above the structure. Further design studies may show that revisions should be made in the plans for the gates and in the shape of the lining below the gates.

The backwater surface for both the 60,000 second-foot and the 200,000 second-foot floods have been computed and are shown in Exhibit No. 5, "Rio Grande - Peñitas-Reynosa Viejo to Hidalgo-Reynosa - Water Surface Profiles".

Since each country will share equally in the flood control benefits of the dam,

dam, it appears that its cost should be divided equally between the two countries. As shown in Exhibit No. 6, the estimated cost of the dam, including the training dikes, is \$5,250,000 U.S. Cy. Estimates have not been developed for any new levees or improvements to existing levees or floodways that may be required, or irrigation diversion facilities since it appears that to the extent required these should be built by and at the expense of the country in which the works are located.

Recommendations

It is recommended that:

1. The modified plan for the Lower Rio Grande International Flood Control Project as hereinabove described be adopted by the Commission.
2. A single diversion dam be constructed at the Anzaldúas site hereinabove described.
3. The dam be constructed substantially in accordance with the preliminary plan shown in Exhibit No. 4, and with irrigation diversion water surface at elevation 103.51 feet (31.55 meters) and the top of the gates at elevation 106.00 feet (32.31 meters).
4. The cost of construction of the dam be divided equally between the two countries through an allocation of work items for performance by the respective Sections of the Commission.
5. Any additional levees or improvements to existing levees or floodways, and any irrigation diversion facilities which each country

may

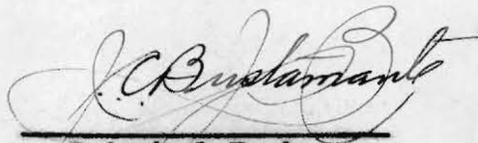
may desire to construct, be constructed by and at the entire expense of the country in which the work is located.

6. The dam be constructed by or under the supervision of the International Boundary and Water Commission.
7. The dam be operated and maintained by the International Boundary and Water Commission in accordance with rules to be hereafter adopted by the Commission and in such manner as to provide an equitable division of use of the floodways of the two countries.

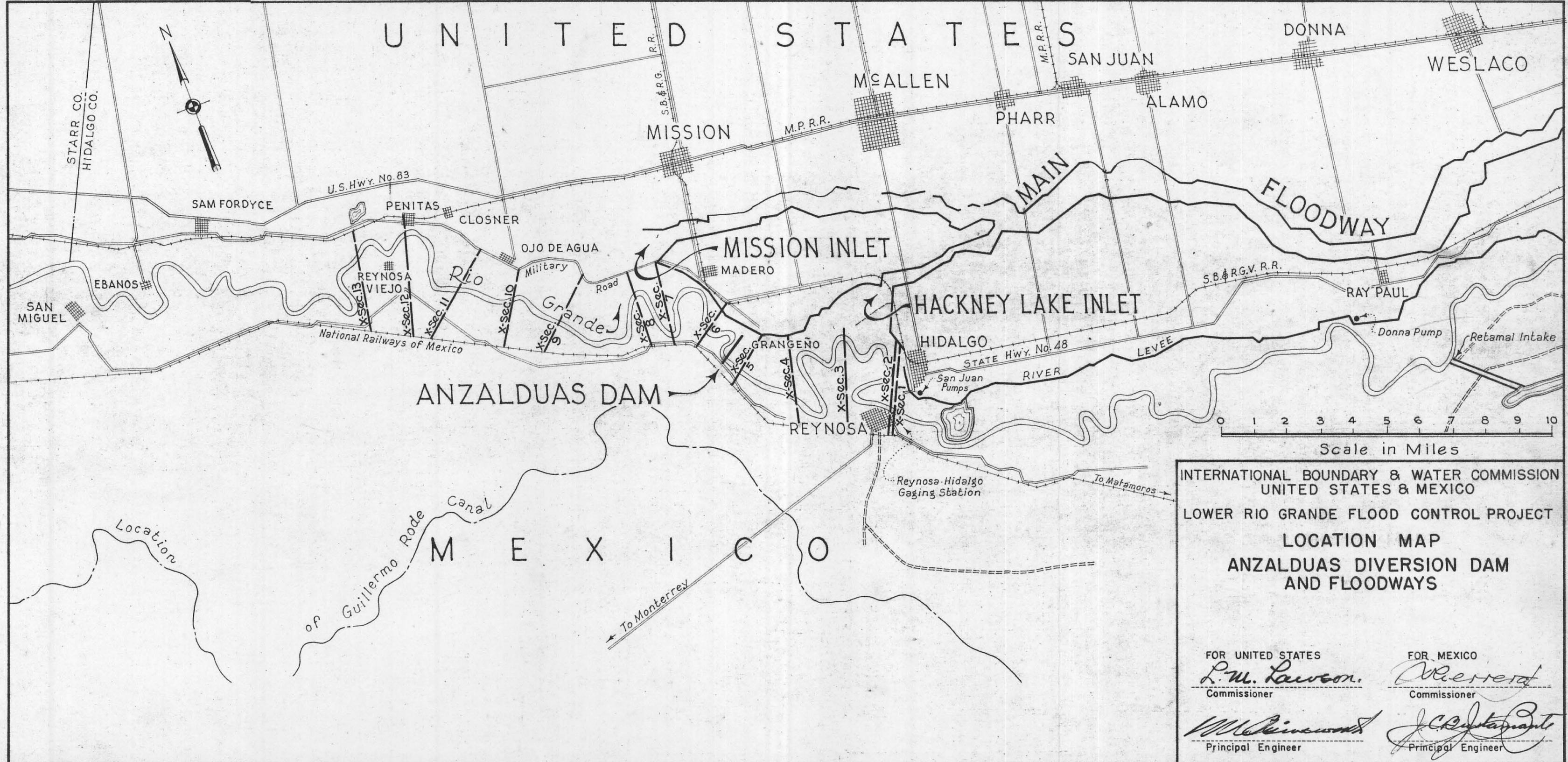
Respectfully submitted,



Principal Engineer
United States Section



Principal Engineer
Mexican Section



INTERNATIONAL BOUNDARY & WATER COMMISSION
 UNITED STATES & MEXICO
 LOWER RIO GRANDE FLOOD CONTROL PROJECT
 LOCATION MAP
 ANZALDUAS DIVERSION DAM
 AND FLOODWAYS

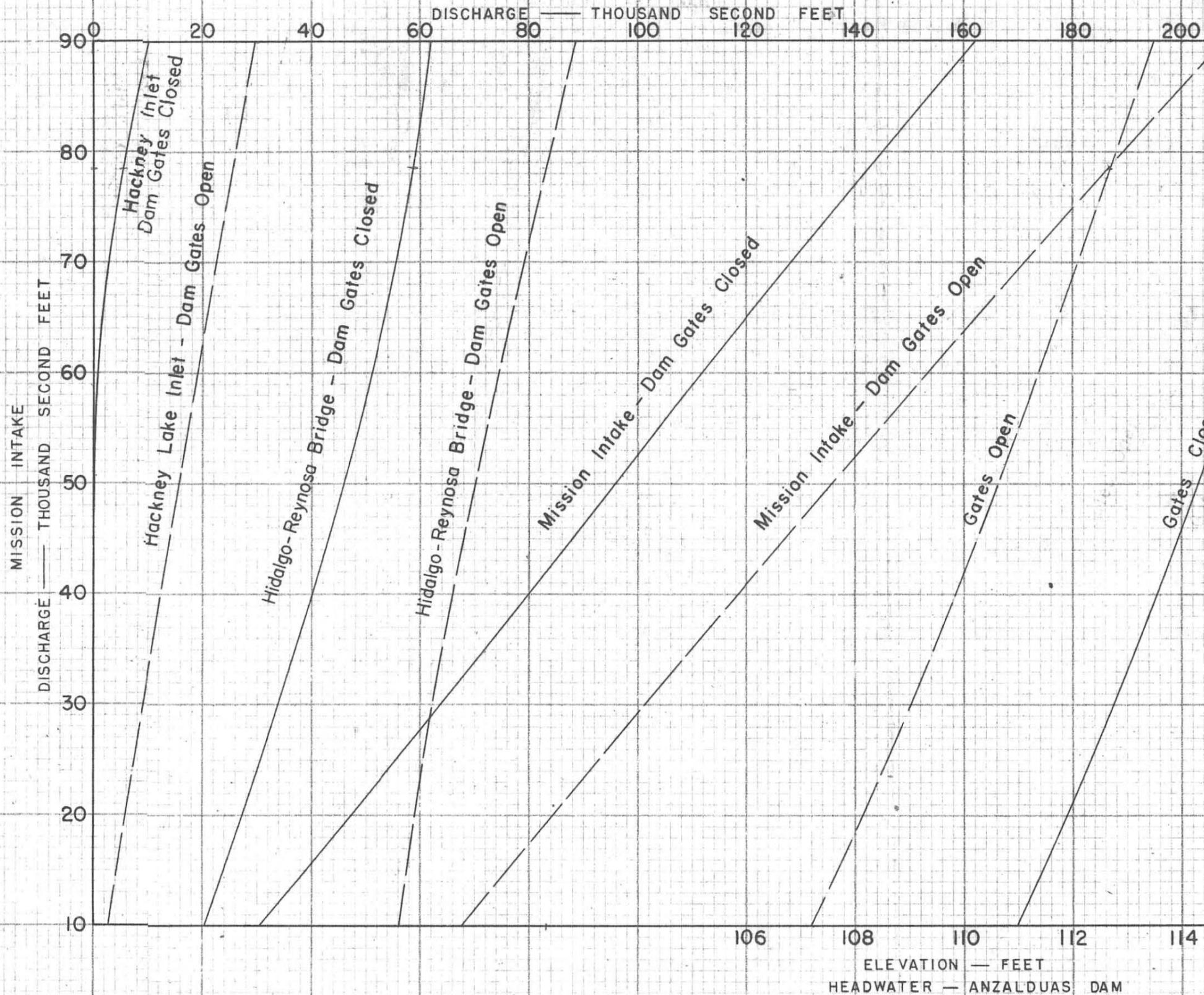
FOR UNITED STATES
L. M. Lawson
 Commissioner

FOR MEXICO
Cherrea
 Commissioner

W. C. ...
 Principal Engineer

J. C. ...
 Principal Engineer

RIO GRANDE ABOVE MISSION INTAKE — RIO GRANDE AT HIDALGO-REYNOSA BRIDGE — HACKNEY LAKE INLET



DIRECTIONS FOR USE OF CHART
 From upper scale of Rio Grande discharge above Mission Intake drop vertically to intersect the Mission Intake curve for desired gate position and draw a horizontal line across the chart through this intersection.
 At left end of this line read Mission Intake discharge. Vertically above intersections of the horizontal line with the appropriate Hackney Lake and Hidalgo-Reynosa Bridge curves, read their discharges on upper scale. Vertically below the intersection of the horizontal line with the appropriate gate position curve, read headwater elevation at the Dam on lower scale.

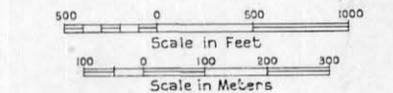
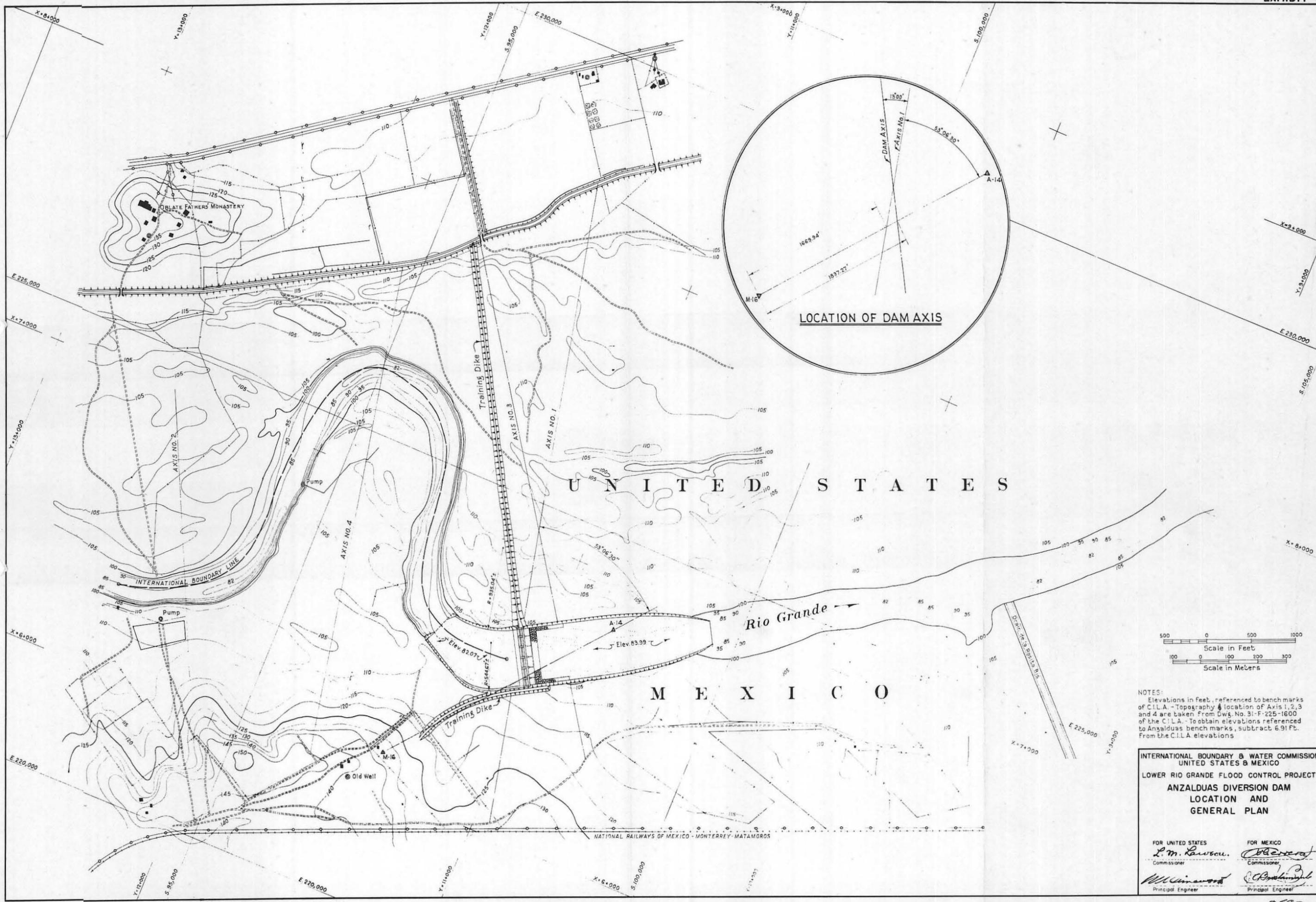
INTERNATIONAL BOUNDARY & WATER COMMISSION
 UNITED STATES & MEXICO
 LOWER RIO GRANDE FLOOD CONTROL PROJECT
ANZALDUAS DIVERSION DAM
DISCHARGE CURVES
WITH GATES OPENED AND CLOSED

FOR UNITED STATES
R. M. Lawsm.
 Commissioner

FOR MEXICO
M. Herrera
 Commissioner

W. J. Sims
 Principal Engineer

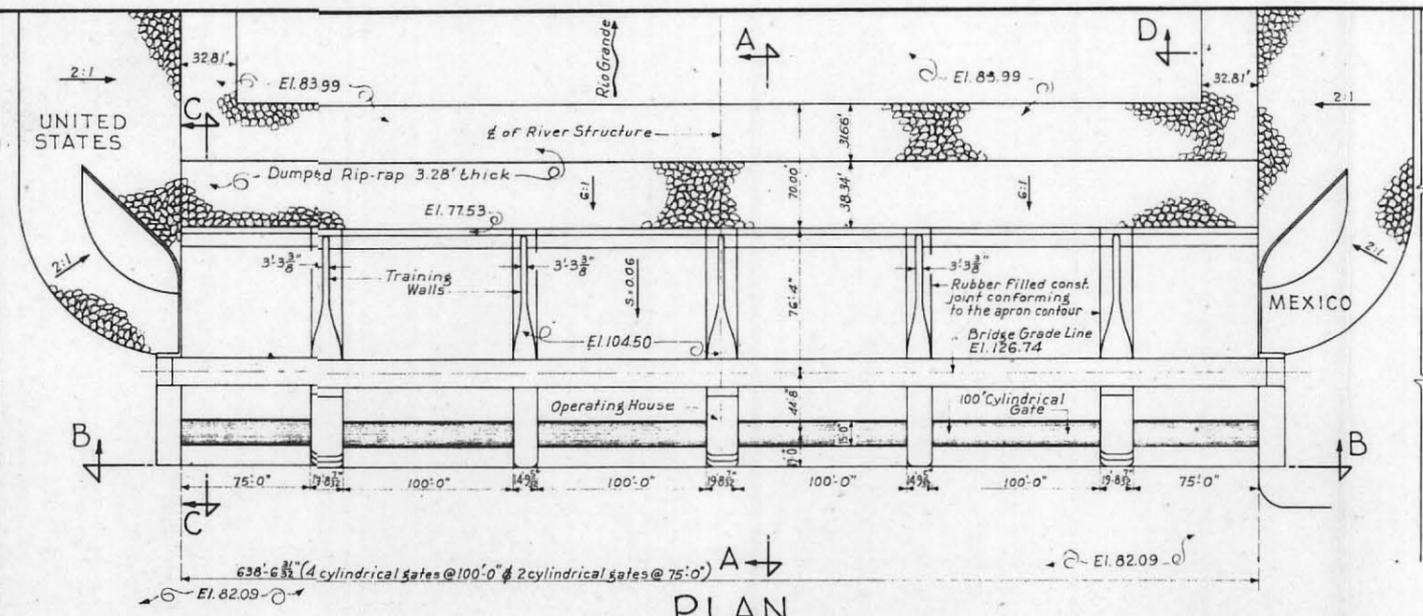
J. C. Detamante
 Principal Engineer



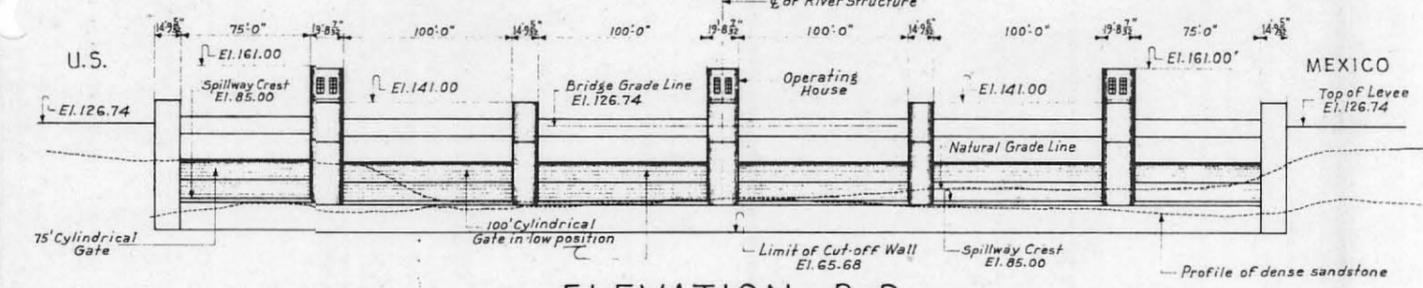
NOTES:
 Elevations in feet, referred to bench marks of C.I.L.A. - Topography & location of Axis 1, 2, 3 and 4 are taken from Dws. No. 31-F-225-1600 of the C.I.L.A. - To obtain elevations referred to Anzalduas bench marks, subtract 6.91 Ft. from the C.I.L.A. elevations

INTERNATIONAL BOUNDARY & WATER COMMISSION
 UNITED STATES & MEXICO
 LOWER RIO GRANDE FLOOD CONTROL PROJECT
 ANZALDUAS DIVERSION DAM
 LOCATION AND
 GENERAL PLAN

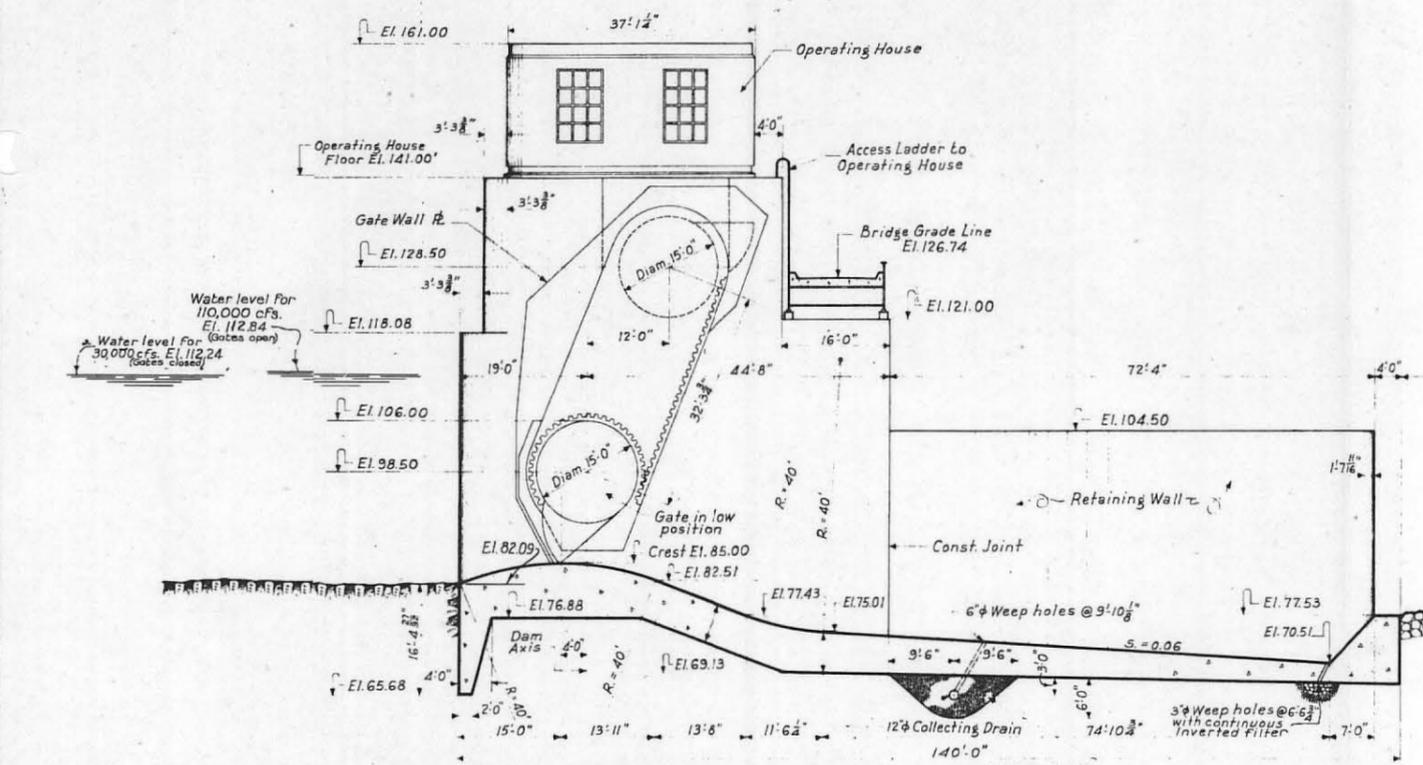
FOR UNITED STATES L. M. Lawson Commissioner	FOR MEXICO <i>[Signature]</i> Commissioner
<i>[Signature]</i> Principal Engineer	<i>[Signature]</i> Principal Engineer



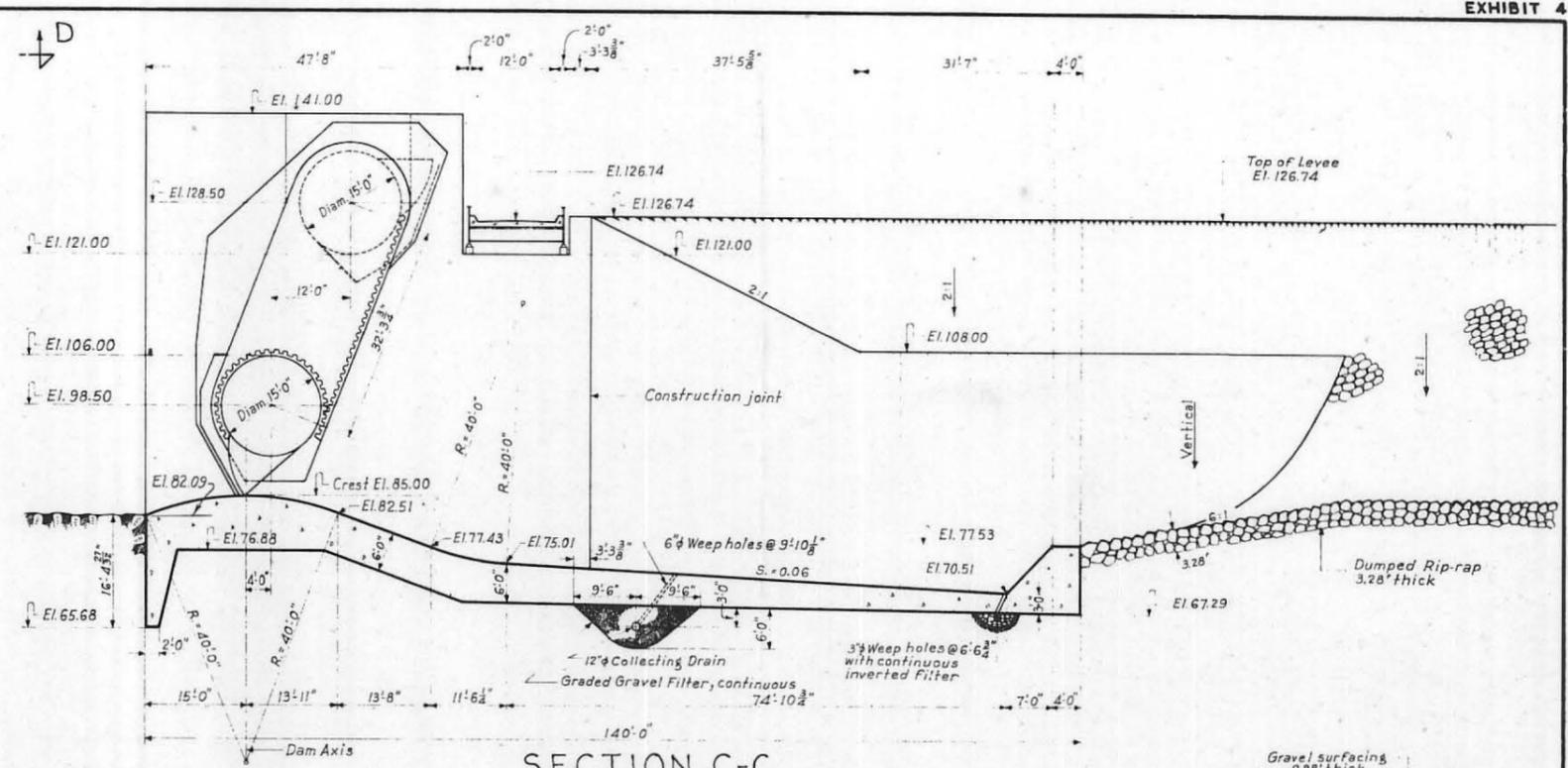
PLAN
Scale 1:500



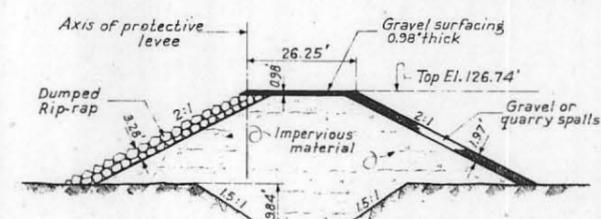
ELEVATION B-B
Scale 1:500



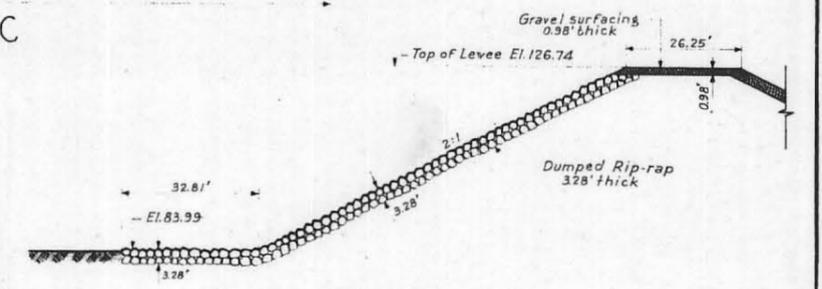
SECTION A-A
Scale 1:125



SECTION C-C
Scale 1:125



LEVEE SECTION
Scale 1:200



SECTION D-D
Scale 1:200

NOTES:
Elevations are referenced to C.I.L.A. bench marks. To obtain the elevations referenced to the Anzalduas bench marks, subtract 6.91 Ft. from the C.I.L.A. elevations.
Reinforcement of structures is not shown.

INTERNATIONAL BOUNDARY & WATER COMMISSION
UNITED STATES & MEXICO
LOWER RIO GRANDE FLOOD CONTROL PROJECT
ANZALDUAS DIVERSION DAM
PLAN AND SECTIONS

FOR UNITED STATES
Commissioner
P. M. ...
Principal Engineer

FOR MEXICO
Commissioner
...
Principal Engineer

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

November 28, 1950

Cost Estimate
Anzalduas Diversion Dam

<u>Item of Work</u>	<u>Unit</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
1. Diversion & Care of River	Lump Sum			\$ 115,000
2. Clearing & Grubbing	Acre	22	25.00	550
3. Earthwork Excavation Structural-Unclass.	C.Y.	110,000	1.00	110,000
4. Earthwork Embankment Backfill Struc.	C.Y.	6,500	1.50	9,750
Dykes	C.Y.	252,000	.50	126,000
5. Concrete	C.Y.	38,600	45.00	1,737,000
6. Reinforcing Steel	Lb.	1,250,000	.12	150,000
7. Metal Work & Gates	Lb.	3,800,000	.40	1,520,000
8. Rubber Joints	L.F.	2,400	3.00	7,200
9. Electrical Installation	Lump Sum			35,000
10. Road Surfacing	C.Y.	6,200	2.50	15,500
11. Rock Riprap	C.Y.	68,000	5.50	<u>374,000</u>
	Sub-Total			\$ 4,200,000
	Overhead & Contingencies - 25%			<u>1,050,000</u>
	Total			\$ 5,250,000

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

November 28, 1950

Cost Estimate
Anzalduas Diversion Dam

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