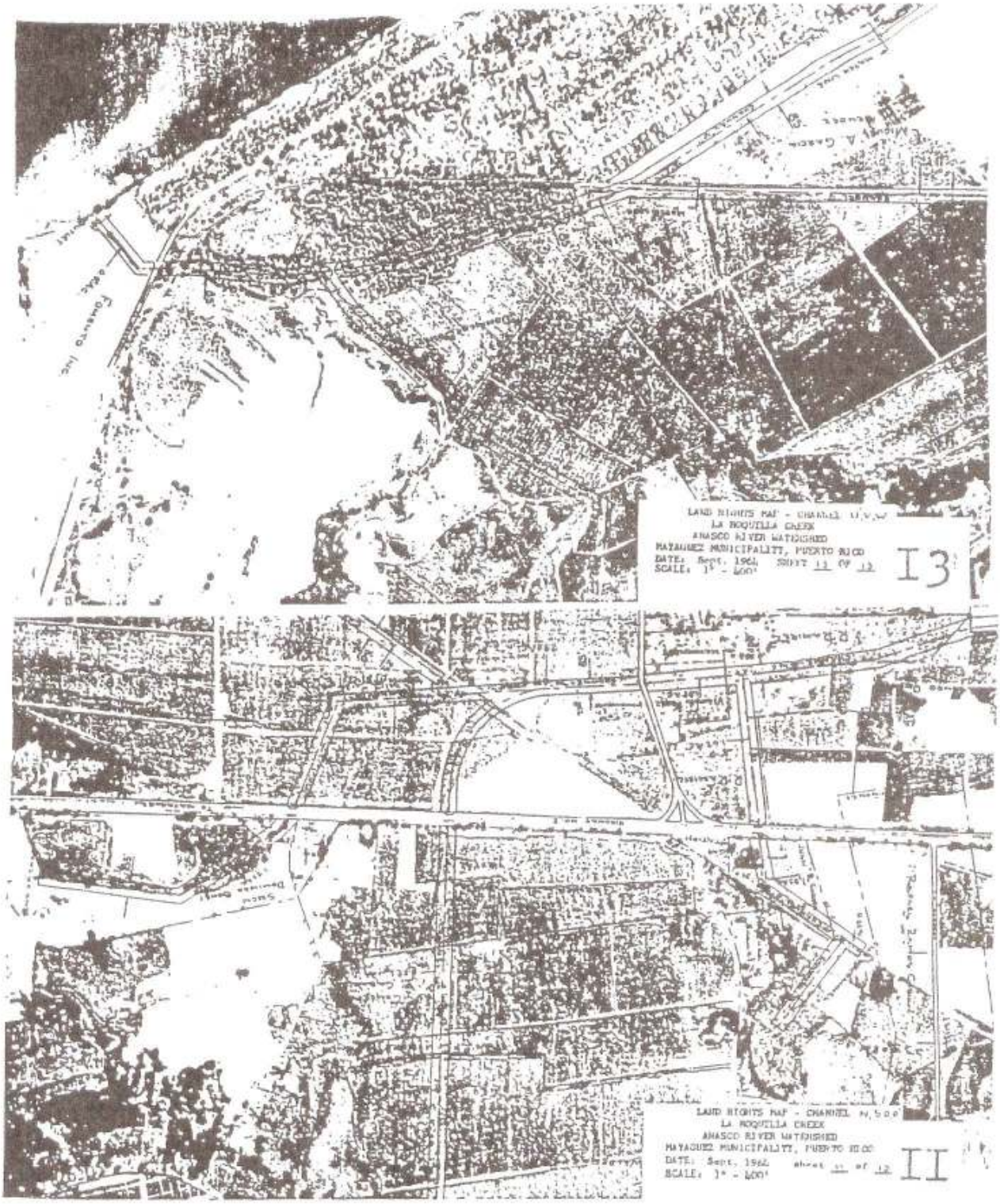
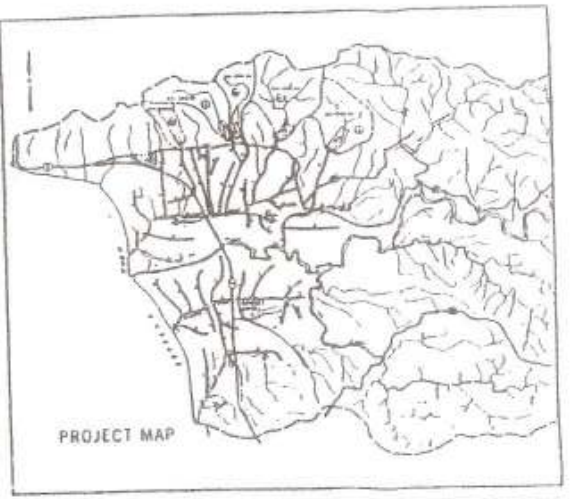


1964 U. S. Department of Agriculture Soil Conservation Service Recommended Channels included in La Boquilla Unit Project of Añasco River Watershed

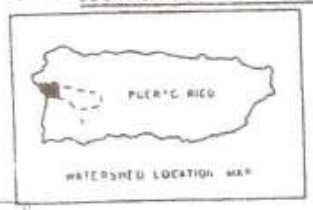
1972 U.S. Department of Agriculture Soil Conservation Service Final Channel Construction included in La Boquilla Unit Project of Anasco River Watershed

LOCATION MAP



PROJECT MAP

INDEX



WATERSHED LOCATION MAP

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWINGS FOR

LA BOQUILLA UNIT PROJECT

AÑASCO RIVER WATERSHED

PUERTO RICO

U S DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SER

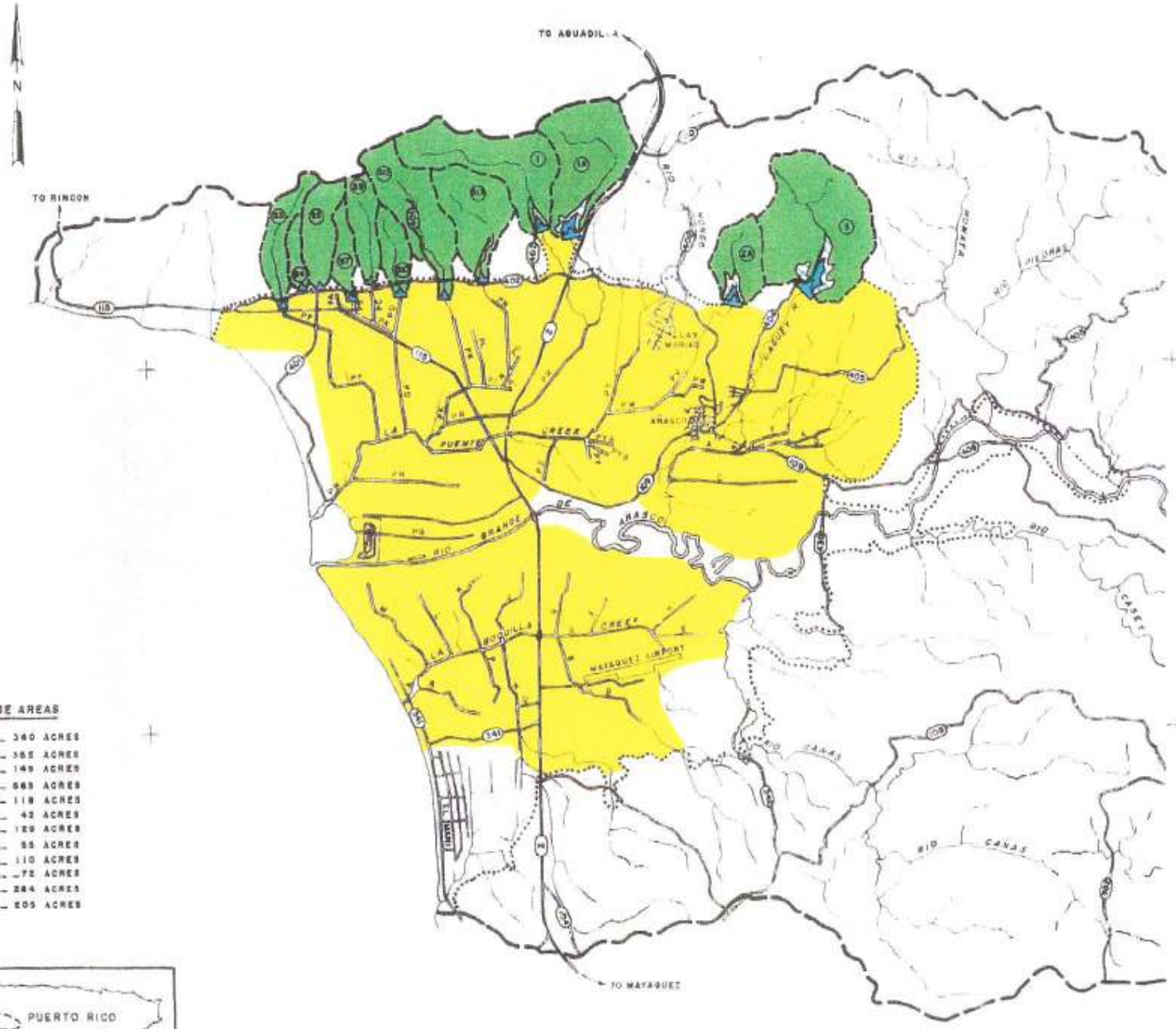
PROJECT MAP

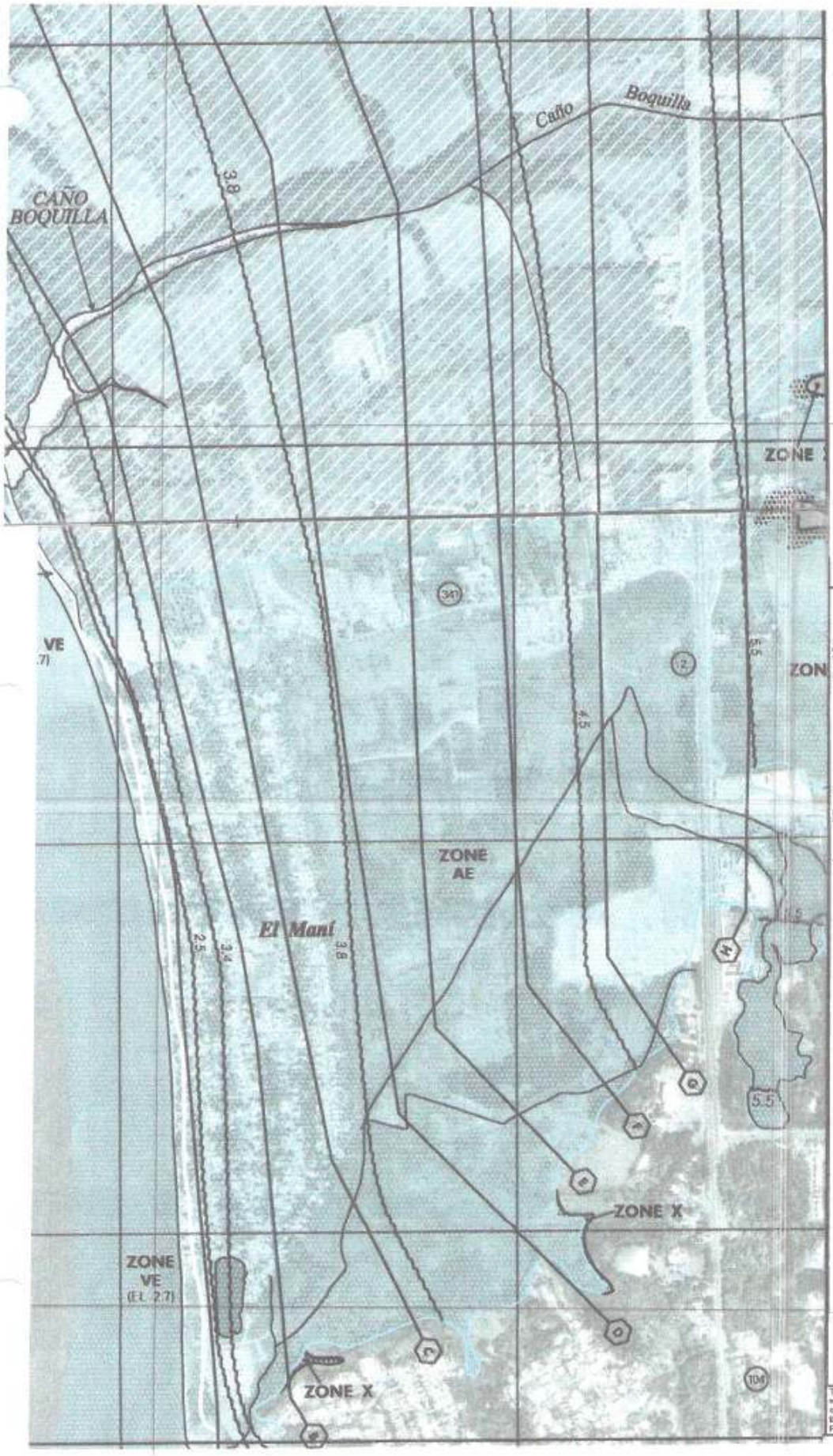
AÑASCO RIVER WATERSHED

MAYAGUEZ, AÑASCO - PUERTO RICO

REVISED JULY 1973

FIGURE 1





NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0520H

FIRM
FLOOD INSURANCE RATE MAP

COMMONWEALTH OF PUERTO RICO AND MUNICIPALITIES

PANEL 520 OF 2150

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PUERTO RICO	[illegible]	0520	H

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
72000C0520H

EFFECTIVE DATE
APRIL 19, 2005

Federal Emergency Management Agency

...y map revision history prior to Commonwealth of Puerto Rico and Municipalities ...ed in the Community Map History table located in the Flood Insurance Study ...s jurisdiction.

...ss if flood insurance is available in this community, contact your insurance ... National Flood Insurance Program at 1-800-638-6620.

MAP SCALE
1:10,000

.25 0 .5
Kilometers

0 500 1000 1500 2000 2500 3000 3500
Feet

1/4 0 1/2
Miles

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0535H

FIRM
FLOOD INSURANCE RATE MAP

COMMONWEALTH OF PUERTO RICO AND MUNICIPALITIES

PANEL 535 OF 2150

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PUERTO RICO	[illegible]	0535	H

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
72000C0535H

EFFECTIVE DATE
APRIL 19, 2005

Federal Emergency Management Agency

Federal Emergency Management Agency

Washington, D.C. 20472

DEC 24 1986

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IA-RA-RS (102a)

Community: Commonwealth of Puerto Rico
Effective Date of this Revision: December 24, 1986
Community Number: 720000

The Honorable Rafael Hernández Colón
Governor of the Commonwealth
of Puerto Rico
La Fortaleza
San Juan, Puerto Rico 00902

Dear Governor Hernández:

This is in reference to a letter dated February 5, 1986, submitted by Mr. Edgar A. Navas, former Executive Vice President of Rexco Industries, Inc., regarding the Flood Insurance Study (FIS) for the Rio Grande de Anasco Basin of the Commonwealth of Puerto Rico. This letter was forwarded to us by our Region II office. With his letter, Mr. Navas submitted a report entitled Hydrologic Studies Regarding the Proposed Revisions of Page Number 13 of Maps Containing Flood Susceptible Zones from the Puerto Rico Planning Board, dated March 6, 1984. This report, prepared by Quinones, Diez, Silva y Asociados, is based on a study that shows that the area downstream of State Road PR-2 and south of State Road PR-341 is located in an ineffective flow area; thus, it should not be included in the regulatory floodway of the Rio Grande de Anasco. Additional data, including maps of the revised area, were submitted at our request on August 7, 1986. Ms. Patria G. Custodio, P.E., Chairperson of the Puerto Rico Planning Board, endorsed the requested revision of the FIS and Flood Boundary and Floodway Map (FBFM) to reflect the appropriate floodway configuration.

Based on the submitted technical data, the floodway boundary has been redelineated downstream of the intersection of State Roads PR-2 and PR-341, as shown on the enclosed annotated FBFM panels. This Letter of Map Revision (LOMR) amends FBFM number 720000, panels 0070 and 0132, dated September 16, 1982, and April 3, 1984, respectively. This LOMR also amends FIS Table 3 "Floodway Data" for the Rio Grande de Anasco to reflect the reduction in floodway widths from cross sections A through G. These changes will be incorporated into the next FIS and FBFM revision for the Rio Grande de Anasco Basin of the Commonwealth of Puerto Rico.

These modifications have been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. As required by this legislation, a community must adopt and enforce floodplain management regulations in order to ensure continued eligibility to participate in the National Flood Insurance Program. Therefore, the Commonwealth of Puerto Rico must enforce these regulations using, at a minimum, the elevations and zone designations in the Special Flood Hazard Areas as shown on your community's Flood Insurance Rate Map and FBFM, including the modifications made by this LOMR.

These modifications are effective as of the date of this letter. However, a review of this determination and any requests for changes should be made within 30 days. Any requests for reconsideration must be based on scientific or technical data.

Since this revision will not be printed and distributed to users such as insurance agents and lenders, the community will serve as the repository for the new data. We encourage you to disseminate widely throughout the community the information reflected by this LOMR in order that interested persons may offer new information or comments.

A Consultation Coordination Officer (CCO) has been designated to assist you with any problems you may have concerning these modifications. The CCO will be the primary Federal Emergency Management Agency (FEMA) contact for your community. Your CCO can be reached at the following address:

Mr. Philip McIntire, Chief
FEMA, Natural and Technological
Hazards Division
26 Federal Plaza, Room 1351
New York, New York 10278
(212) 264-3276

Any questions may be directed to your CCO.

Sincerely,

John L. Matticks
Acting Chief, Risk Studies Division
Federal Insurance Administration

Enclosures

cc: Ms. Patria G. Custodio, P.E.
Mr. Edgar A. Navas
Mr. José F. Sánchez, Quinones, Diez, Silva y Asociados

ESTADO LIBRE ASOCIADO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACION

Centro Gubernamental Minillas, Edif. Norte
Ave. De Diego, Pda. 22
Aptdo 41119, San Juan, P.R. 00940 - 9985

FEB. 10 1987

Sr. Edgar Navas
Rexco Industries, Inc.
G.P.O. Box CE
San Juan, Puerto Rico 00936

Estimado señor Navas:

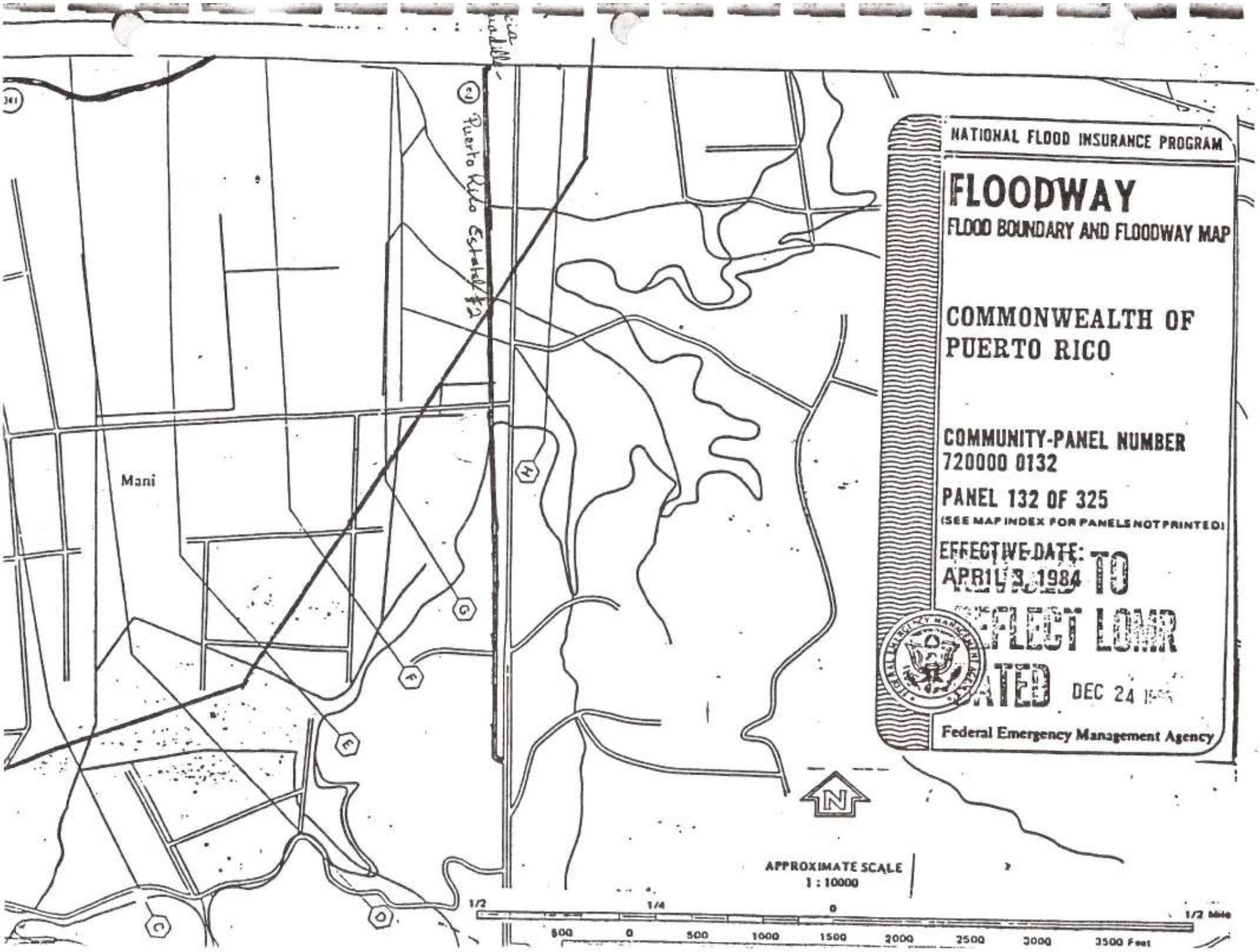
Mediante comunicación del 24 de diciembre de 1986 y en respuesta a su solicitud de revisión de los límites de la Zona-1 del Río Grande de Añasco, la Agencia Federal Sobre Manejo de Emergencias enmendó los Paneles 720000-0070 y 0132. Dichos paneles corresponden a las hojas número 13D y 22B de los Mapas de Zonas Susceptibles a Inundaciones.

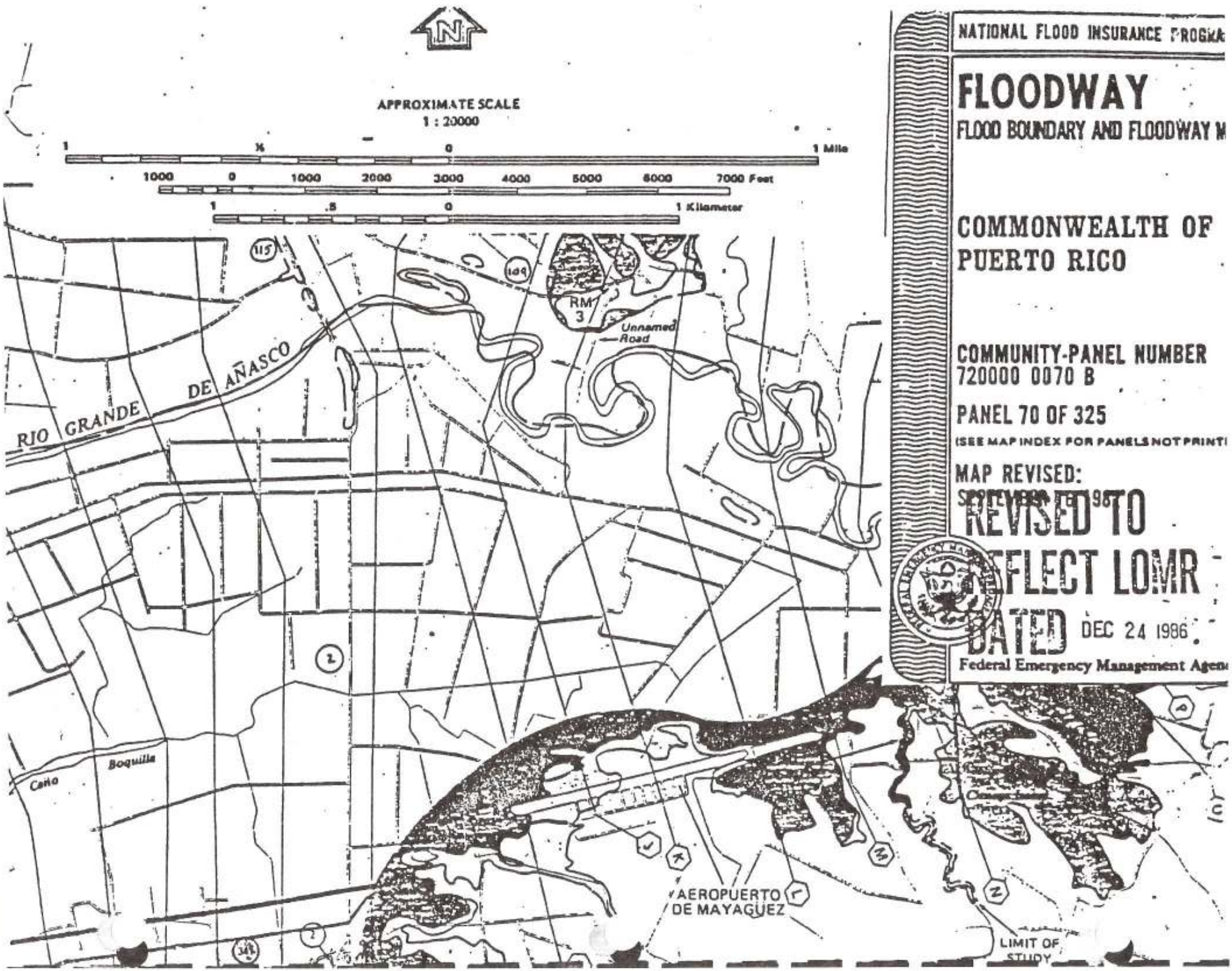
De acuerdo a la Ley Núm. 3 del 1961, según enmendada, se requiere, como parte del procedimiento para enmendar un Mapa de Zonas Susceptibles a Inundaciones, la celebración de una vista pública. De usted interesar en adelantar la celebración de dicha vista, deberá sufragar los gastos del aviso de prensa, de lo contrario, se incluirá en la próxima vista pública de la Región de Mayaguez, la cual esperamos se celebre dentro de los próximos meses.

Cordialmente,

Miriam Almodóvar
Secretaria

Anejos


NATIONAL FLOOD INSURANCE PROGRAM
FLOODWAY
FLOOD BOUNDARY AND FLOODWAY MAP
COMMONWEALTH OF PUERTO RICO
COMMUNITY-PANEL NUMBER
720000 0132
PANEL 132 OF 325
(SEE MAP INDEX FOR PANELS NOT PRINTED)
EFFECTIVE DATE:
APRIL 3, 1984
TO
REFLECT LOMR
DATED DEC 24
Federal Emergency Management Agency
Mani
Puerto Rico Estatal #2
APPROXIMATE SCALE
1 : 10000
1/2 1/4 0 1/2 Mile
500 0 500 1000 1500 2000 2500 3000 3500 Feet


N
APPROXIMATE SCALE
1 : 20000
1 ½ 0 1 Mile
1000 0 1000 2000 3000 4000 5000 6000 7000 Feet
1 .5 0 1 Kilometer
115
109
RM 3
Unnamed Road
RIO GRANDE DE AÑASCO
Caño Boquilla
AEROPUERTO DE MAYAGÜEZ
LIMIT OF STUDY
NATIONAL FLOOD INSURANCE PROGRA
FLOODWAY
FLOOD BOUNDARY AND FLOODWAY M
COMMONWEALTH OF PUERTO RICO
COMMUNITY-PANEL NUMBER
720000 0070 B
PANEL 70 OF 325
(SEE MAP INDEX FOR PANELS NOT PRINTI
MAP REVISED:
REVISED TO
FLECT LOMR
DATED DEC 24 1986
Federal Emergency Management Agen

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (METERS)	SECTION AREA (SQUARE METERS)	MEAN VELOCITY (METERS PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(METERS MSL)			
Rio Grande de Anasco								
A	109	3,160	4,709	1.1	2.48	2.48	2.78	0.30
B	602	3,220	7,982	2.7	3.43	3.43	3.53	0.10
C	1,041	3,590	10,016	0.5	3.63	3.63	3.76	0.13
D	1,408	3,680	12,721	0.4	3.76	3.76	3.90	0.14
E	1,778	4,480	13,478	0.4	3.91	3.91	4.06	0.15
F	2,160	4,510	14,460	0.4	4.36	4.36	4.52	0.16
G	2,446	4,590	14,893	0.4	4.66	4.66	4.82	0.16
H	3,077	4,615	16,249	0.3	5.45	5.45	5.62	0.17
I	3,277	3,562	9,005	0.5	5.98	5.98	6.16	0.18
J	3,885	2,793[2]	5,911	0.8	6.70	6.70	6.83	0.13
K	4,768	1,935[2]	4,718	1.0	7.23	7.23	7.32	0.09
L	6,141	1,978[2]	4,804	1.0	8.05	8.05	8.15	0.10
M	7,107	2,429	6,703	0.7	8.61	8.61	8.68	0.07
N	9,007	2,219	6,663	0.7	8.97	8.97	9.05	0.08
O	9,878	2,130	6,442	0.7	9.37	9.37	9.45	0.08
P	10,895	1,781	5,364	0.8	10.16	10.16	10.28	0.12
Q	11,240	1,401	5,221	0.9	10.88	10.88	11.02	0.14
R	12,285	612	3,958	1.1	12.12	12.12	12.21	0.09
S	12,690	532	2,920	1.5	12.59	12.59	12.75	0.16
T	13,653	622	4,383	1.0	14.17	14.17	14.33	0.16
U	14,562	451	2,484	1.7	14.69	14.69	14.94	0.25
V	14,892	420	2,409	1.7	15.20	15.20	15.42	0.22
W	15,119	405	2,226	1.9	15.55	15.55	15.77	0.22
X	15,374	323	1,744	2.3	16.08	16.08	16.36	0.28
Y	15,665	537	2,630	1.6	17.06	17.06	17.26	0.20

[1]Meters Above Mouth [2]Width Does Not Include Island

REVISED TO REFLECT LOMR DATED DEC 24 1986

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIO GRANDE DE ANASCO, PR

FLOODWAY DATA

RIO GRANDE DE ANASCO


ZONA-1-M
ELEV. 1-6 MTS.
ZONA-2
ZONA-2
Punta Algarrobo
ZONA-2
ALGARROBOS
ETAS
ZONA

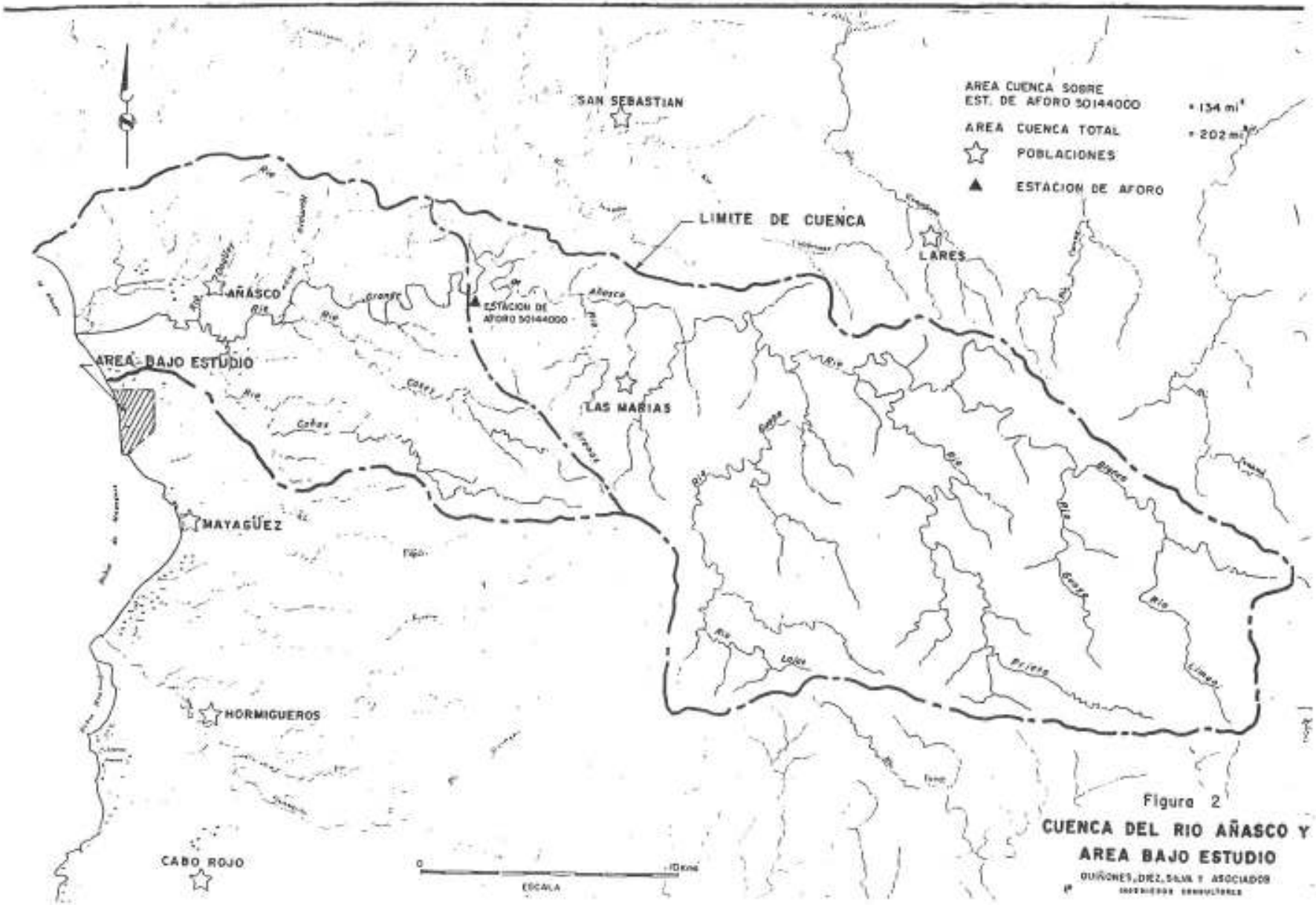
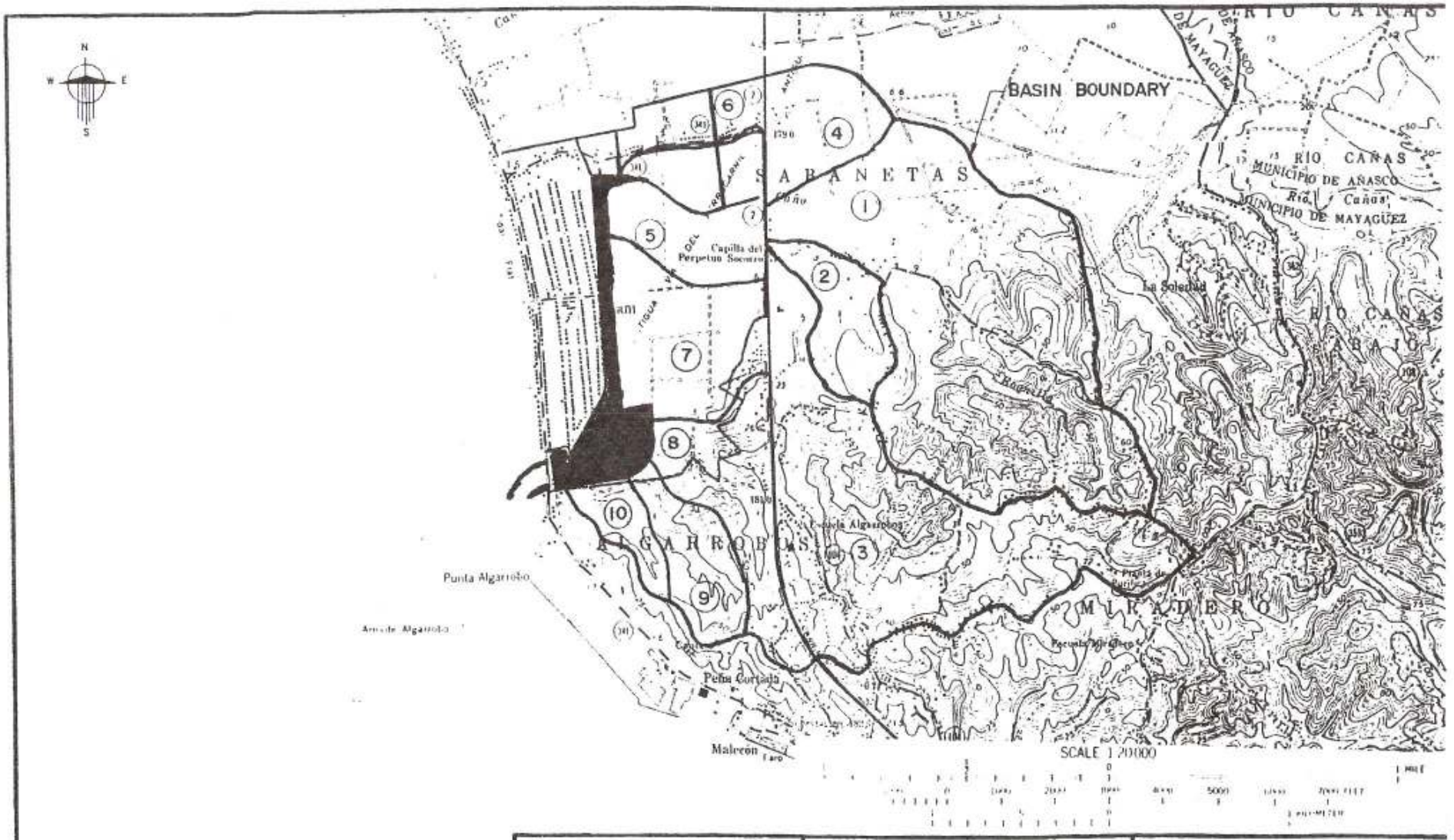


Figura 2

CUENCA DEL RIO AÑASCO Y AREA BAJO ESTUDIO

QUIÑONES, DIEZ, SILVA Y ASOCIADOS
INGENIEROS CONSULTORES



SOURCE: USGS QUADRANGLES FOR MAYAGUEZ AND RINCON, 1964

ELITE VALLEY DEVELOPMENT
H/H STUDY

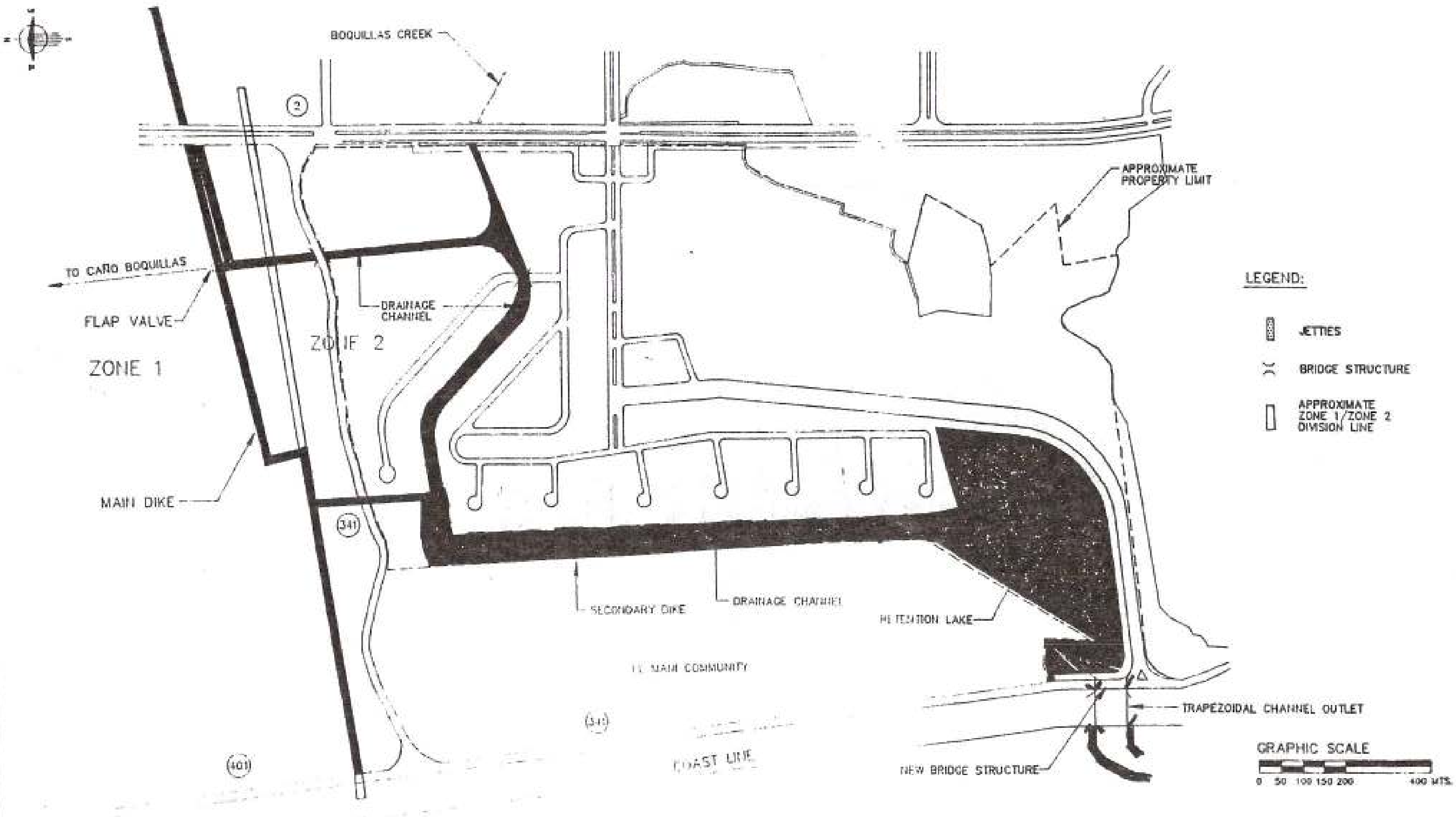
MAYAGUEZ, PUERTO RICO

LAW ENVIRONMENTAL – CARIBE
EDIFICIO CASO, SUITE 603
1225 PONCE DE LEON AVENUE
SANTURCE, PUERTO RICO 00907
(809) 722-7740

SUB-BASIN DELINEATION
ALTERNATIVE A

PROJECT NO. 54-0515

FIGURE 6



SOURCE OF BASE MAP: DEVELOPMENT PLAN PROVIDED BY INVESTMENT GP & SR INC.

ELITE VALLEY DEVELOPMENT
H/H STUDY

MAYAGUEZ, PUERTO RICO

LAW ENVIRONMENTAL - CARIBE
EDIFICIO CASO, SUITE 603
1225 PONCE DE LEON AVENUE
SANTURCE, PUERTO RICO 00907
(809) 722 7740

ALTERNATIVE A CONCEPT

PROJECT NO. 54-0515

FIGURE 4

REXCO INDUSTRIES, INC.
SAN JUAN, P.R.

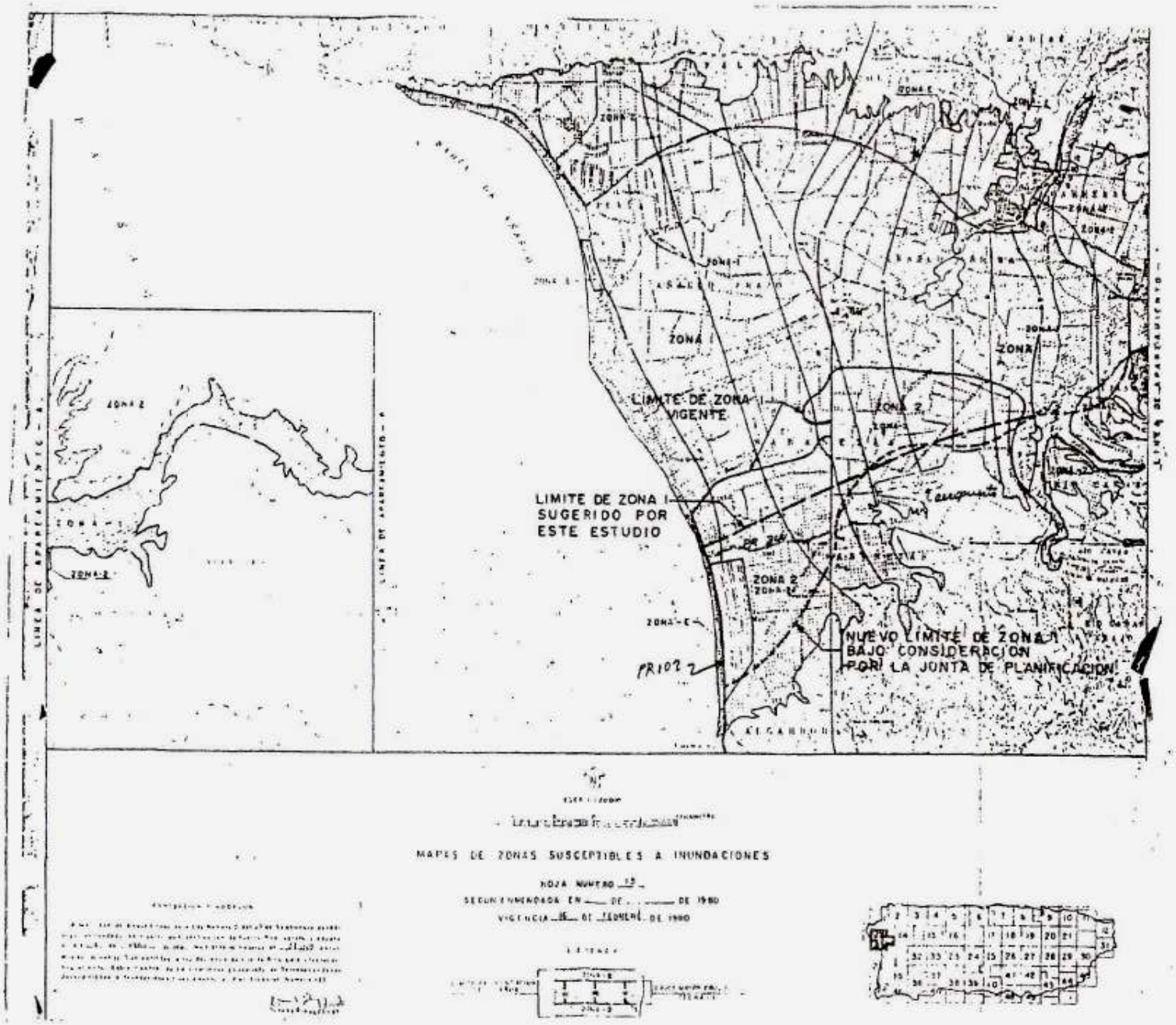
AREA EL MANI
MAYAGUEZ P. R.

ESTUDIOS HIDROLOGICOS SOBRE LA PROPUESTA REVISION DE LA HOJA NUM. 13 DE LOS MAPAS DE ZONAS SUSCEPTIBLES A INUNDACIONES DE LA JUNTA DE PLANIFICACION

6 DE MARZO DE 1984

QUIÑONES, DIEZ, SILVA Y ASOCIADOS
INGENIEROS CONSULTORES

Exhibit 4.1.6-17 1984 Hydrologic and Hydraulic Study done by Quiñones, Dfaz, Assoc.



MAPAS DE ZONAS SUSCEPTIBLES A INUNDACIONES

HOJA NUMERO 13

SECUENCIADA EN ___ DE ___ DE 1980

VIGENCIA 16 DE ENERO DE 1980

FIGURE #33

1928 Past Historical Records of High Flooding Level in the Anasco River Watershed.

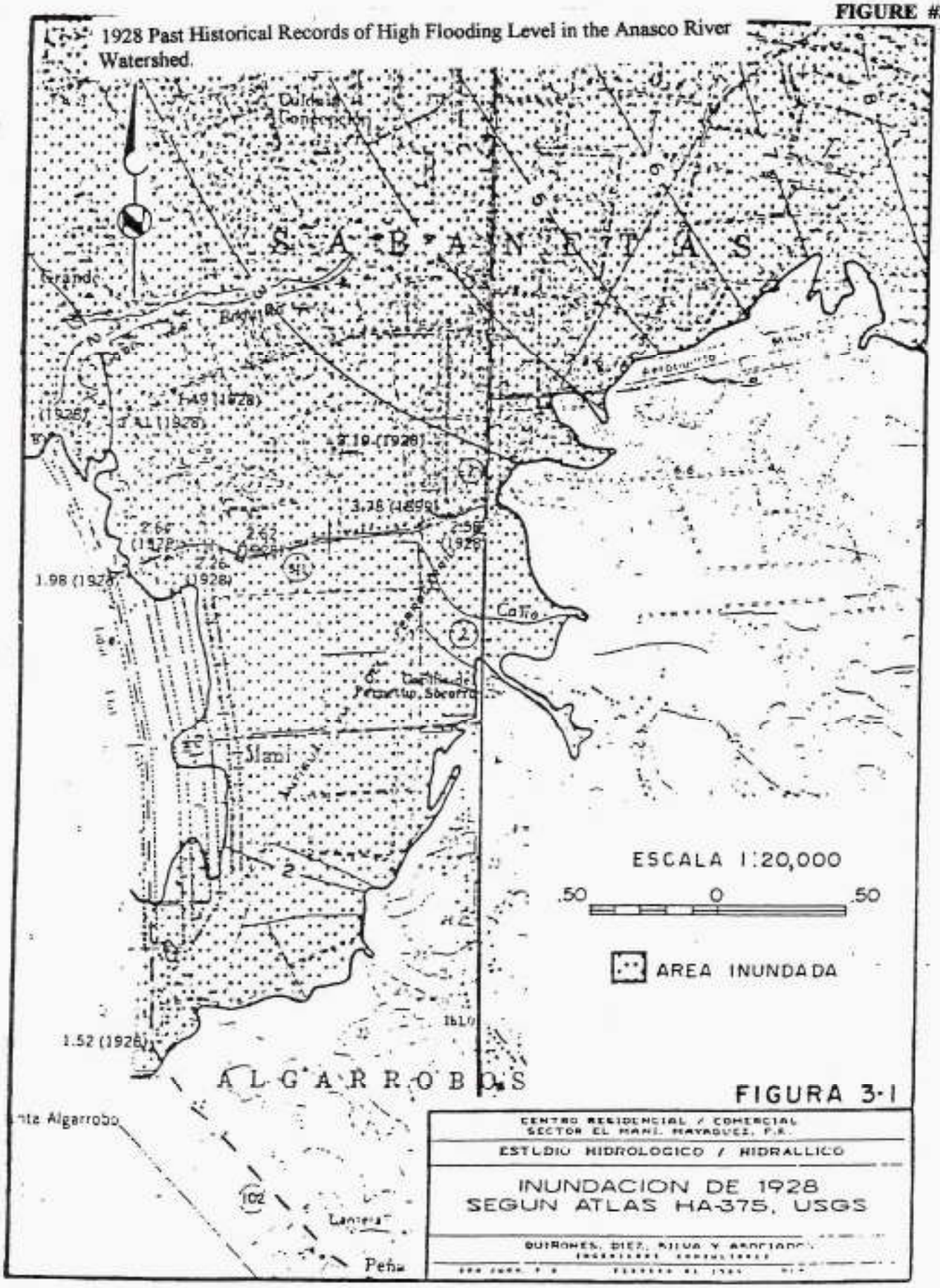
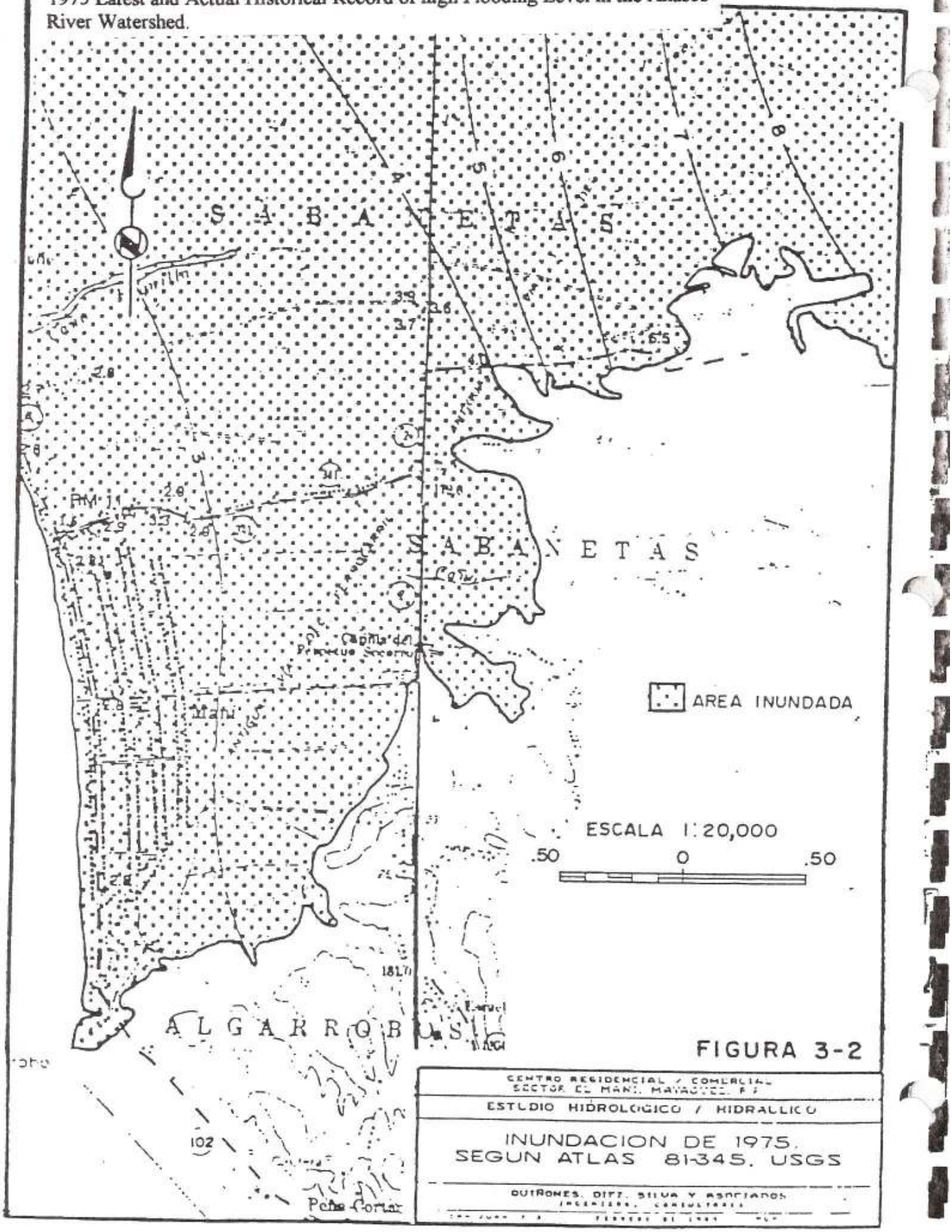
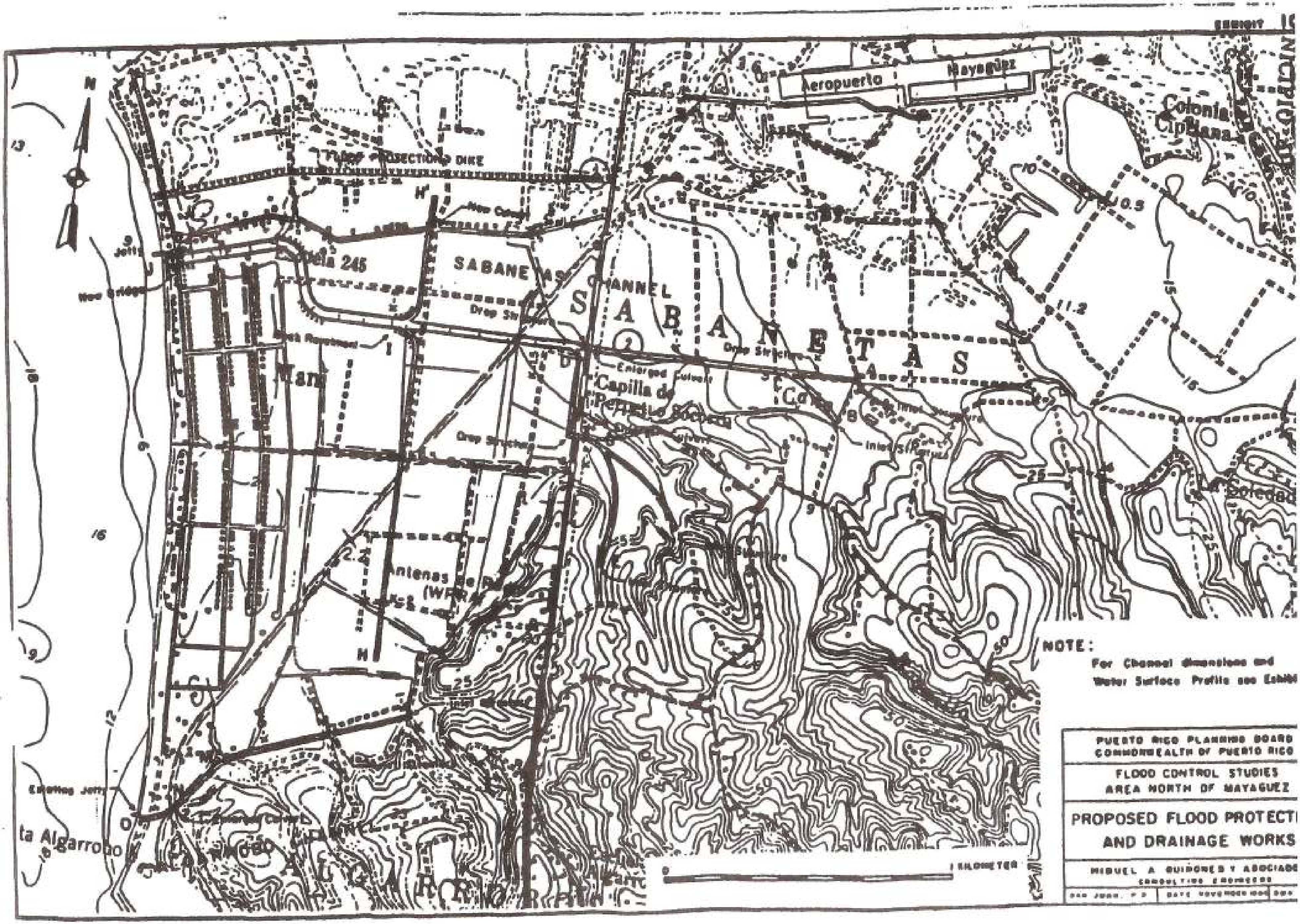


FIGURE #34

1975 Latest and Actual Historical Record of high Flooding Level in the Anasco River Watershed.





NOTE:

For Channel dimensions and Water Surface Profile see Exhibi

PUERTO RICO PLANNING BOARD
COMMONWEALTH OF PUERTO RICO

FLOOD CONTROL STUDIES
AREA NORTH OF MAYAGÜEZ

PROPOSED FLOOD PROTECTI
AND DRAINAGE WORKS

MIGUEL A. QUIÑONES Y ASOCIADO
CONSULTING ENGINEERS
SAN JUAN, P.R. DATE NOVEMBER

SUMMARY

On the north side of the City of Mayagüez and to the east of the "El Manf" Rural Community, lies an area of some 660 acres (shown cross-hatched on Exhibit 1) which is a part of the Añasco River flood plain and is subject to inundation by this river during its larger floods, and also by a number of creeks that drain the hills along its south and east boundaries.

Although this area is at present classified as agricultural land and forms part of the area included in the Añasco River Watershed Project, two applications have been submitted to the Planning Board for urban developments within its limits. In the event of a change of policy on the use of this land for urban developments, this would require its protection against the floods of the Añasco River by means of a dike, the improvement of internal drainage channels for the effective removal of water from the watersheds of existing creeks draining into the protected area, and the landfilling of low zones so that the storm sewer systems from future urban developments may discharge against the level of the water flowing in the drainage channels during storms. This report presents a study of the flood protection and drainage works which would in that case be necessary.

The U. S. Geological Survey, through its cooperative program with the P. R. Department of Public Works, made a survey of high water marks in the Añasco River flood plain near the area under study. According to this survey, the worst flood in the area of which there is record was that produced by the San Ciriaco Hurricane in the year 1899. Exhibit 1 shows the maximum recorded water elevations during this flood and during the San Felipe Hurricane in 1928. The probable limits of inundation in the Añasco River flood plain at and near the area under study, as estimated from the aforementioned flood data, is also shown on Exhibit 1.

Three main creeks drain into the diked area. For the purpose of this study they have been identified as the Boquilla Este Creek, the Boquilla Oeste Creek, and the Algarrobo Creek, as shown on Exhibits 1 and 2. Boquilla Este and Boquilla Oeste Creeks drain watersheds of 685 and 584 acres respectively from the hills which lie almost to the east of the area to be protected, and Algarrobo Creek drains a watershed of 316 acres from hills on the south side.

The Boquilla Este and Boquilla Oeste creeks have well defined channels along their descent from the hills, but as they reach the flood plain their channels become rather undefined. After crossing separately State Road No. 2, they join into a single channel which at present flows to the north and disappears into marshy land that drains into the Caño la Boquilla. The various tributaries of the Algarrobo Creek similarly have a vaguely defined

The determination of the maximum water surface profiles was based on the assumption that the design flows would be discharged against a maximum probable wind tide of one meter, as recommended for this area by the local office of the U. S. Weather Bureau. This assumption provides a reasonably safe design, since it assumes the coincidence of peak flow and maximum tide.

In proportioning the channel sections and selecting the channels slopes it has been attempted to maintain the water surface profiles as low and flat as possible to reduce to a minimum future landfilling requirements in the areas to be developed. On the other hand, due consideration has been given to design velocities of flow so that no rock revetment will be needed along the earth channels side slopes, except at bends, confluences, and near the mouth, and that at the same time siltation of the channels will be kept within reasonable practical limits.

Two existing large culverts under State Road No. 2 provide passage for the Boquilla Creeks at present. Hydraulic analyses of these culverts have indicated that by enlarging them from two to three openings they can be used to pass the flow of the proposed channels under State Road No. 2. Drop structures will be necessary below these culverts on the west side of the road.

A portion of the old road No. 2 runs adjacent to the new State Road No. 2, on the east side, across the proposed alignment of the Sabanetas Channel at points east of these culverts. At these two points the old road has very small culverts which are inadequate for the flows being considered in this study. Inspection of the area revealed that the existence of the old road is not essential at the specific points of intersection of the old road and the channels, and should be destroyed to permit the free passage of the channels.

Horizontal bottom channels have been recommended for the flat area west of State Road No. 2, with a constant bottom elevation of -1.0 meters with respect to mean sea level. This will permit the use of these channels for some degree of boating activities.

New structures that will be necessary as part of the proposed drainage scheme are indicated on Exhibits 10 and 11. These comprise channel inlet structures at points A, B, E, F, K, and L which correspond to the upstream ends of the channels, an additional opening at each of the two box culverts across Road No. 2, drop structures downstream from these culverts, an additional pipe for the existing 3-pipe culvert at State Road No. 341, a

bridge about 35 meters long at the point where the Sabanetas Channel crosses State Road No. 341 near the channel mouth, and a jetty about 40 meters long alongside the Sabanetas Channel mouth to keep it open.

The estimated cost of the proposed flood protection and drainage work is $1,051,000.

channel as they reach the flood plain, which flows southwesterly into the sea at Punta Algarrobo. The flat land west of State Road No. 2, which consists of sugar cane fields, drains mainly through existing agricultural drainage channels which flow into the Algarrobo Creek.

Exhibit 10 shows the general arrangement and location of the flood protection dike and drainage channels which are proposed as a result of this study. The dike is to be an earth embankment of trapezoidal cross-section as shown on Exhibit 11. Its top elevation has been set at 0.5 meters above the high water elevation of the 1899 flood. Once the flood protection dike is built, the Boquilla Creeks can no longer drain toward the Caño La Boquilla, but another independent outlet to the sea must be provided. Various layouts were considered for the drainage channels within the protected area. The layout shown in Exhibit 10 was selected as the most adequate and economical scheme. It comprises two separate channels; one, called the Sabanetas Channel, which drains the Boquilla Oeste and Boquilla Este Creeks and most of the flat land, and flows westward toward a new outlet between State Road No. 341 and the Manf Community; and another, called the Algarrobo Channel, which drains the Algarrobo Creek and a small part of the flat land, and flows along the present Algarrobo Creek channel to its outlet at Punta Algarrobo. The area in the flat land drained by the Algarrobo Channel in this scheme has been purposely reduced to that amount which will permit using the existing culvert under State Road No. 341 at its mouth without unduly raising the water surface profiles in the channel.

An important factor which has been given consideration in the preparation of the channel layout is that it should enable the best use of the land for urban purposes. For this reason areas which must necessarily be fractured by the channel layout have been kept as wide and as rectangular in shape as possible.

For the purpose of designing the drainage channels it has been estimated that the use of peak flows corresponding to a storm with a 25-year recurrence period will result in a satisfactory hydraulic design. However, in order to insure the adequacy of the channels when subjected to flows of extraordinary recurrence periods, a freeboard of 0.30 meters has been allowed above the water surface profile corresponding to a storm of 100-year frequency. Hydrologic studies have led to the development of flow hydrographs (Exhibit 4 and 5) at selected points located along the Boquilla Creeks, the Algarrobo Creek, and the proposed channels, for the rainfall intensities corresponding to storms of 25-year and 100-year frequencies. The peak flows determined the required dimensions of the proposed drainage channels and the water surface profiles against which future developments must discharge their storm sewer systems.

INTRODUCTION

Purpose

The purpose of this report is to present the results of a study to provide flood protection and internal drainage for an area north of the City of Mayagüez, P. R., and south of State Road No. 341, which is subject to inundation by the flood waters of the Añasco River, in the event that it were decided by the Planning Board to classify this land for urban uses.

Scope

The scope of this study includes the following:

1- Assembly of all pertinent data on rainfall, runoff, highwater marks of major floods of the Añasco River, and maximum tides to be expected in the coastal zone where the area under study is located.

2- Hydrologic and hydraulic studies for the purpose of developing project design flows for the proposed flood protection and drainage works.

3- Preparation of a flood protection and drainage scheme which will protect the area from flooding by the Añasco River and will provide adequate internal drainage.

4- Obtainment of such minimum topographic data and soil surveys as required for the general layout schemes to be studied.

5- Preliminary recommendations as to finish grade elevations for the adequate drainage of proposed developments inside the protected area.

6- Preliminary estimates of cost of the proposed flood protection and drainage works.

Prior reports

In December 1960 a report entitled "Watershed Work Plan - Añasco River Watershed" was issued by the Soil Conservation Service of the U.S. Department of Agriculture. This report was prepared jointly by the Commonwealth

Department of Agriculture, local soil conservation district organizations, the municipalities of Mayagüez and Añasco, and the Soil Conservation Service. The Plan, with its subsequent amendment of 1964, constitutes a proposal for the construction of flood protection measures for the purpose of:

"1- Protecting sugar cane lands, roads, and pastures from frequent floodwater damages:

2- reducing the rate of channel fill in natural channels and main and lateral drainage ditches; and

3- providing an improved drainage system with adequate outlets..."

The drainage scheme proposed in this Plan, being mainly for agricultural purposes, was not designed to prevent flooding of the lands. It was based on providing drainage channels with sufficient capacity to dewater, during a period of 24 hours, the overflowed waters in the Añasco River flood plain from a flood with a 3-year recurrence. Such drainage system, although sufficient for agricultural purposes, would be inadequate for urban developments.

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