SECTION 205
FLOOD CONTROL

MARCH 2002

RIO CULEBRINAS
AGUADILLA-AGUADA, PUERTO RICO

DRAFT
DETAILED PROJECT REPORT
AND
ENVIRONMENTAL ASSESSMENT

US Army Corps of Engineers
Jacksonville District

Municipio de Aguada

Municipio de Aguadilla

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RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
SECTION 205
DETAILED PROJECT REPORT AND
ENVIRONMENTAL ASSESSMENT

A STUDY TO DETERMINE THE FEASIBILITY OF PROVIDING A FLOOD CONTROL PROJECT FOR THE RIO CULEBRINAS IN THE VICINITY OF AGUADILLA AND AGUADA, PUERTO RICO

JACKSONVILLE DISTRICT
U. S. ARMY CORPS OF ENGINEERS

MARCH 2002

RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
DETAILED PROJECT REPORT

SYLLABUS

This report describes the problems resulting from the overflow of Río Culebrinas at the southwest portions of the town of Aguadilla and the community of Espinar at Aguada, formulates several alternatives to reduce flooding damage, and recommends a plan of action. The report was prepared under the authority provided in Section 205 of the Flood Control Act of 1948 as amended. The study was conducted at the request of the Municipalities of Aguadilla and Aguada.

The study area lies in the alluvial flood plain of Río Culebrinas between the municipalities of Aguadilla and Aguada. This area is located in the northwestern coast of Puerto Rico. The Río Culebrinas has a drainage area of approximately 267 square kilometers. Río Culebrinas main channel has a relatively low hydraulic capacity at the alluvial valley. The excess discharge flows over the banks of the river into the Caño Madre Vieja alluvial valley producing damage in the adjacent communities. The 100-year flood for existing conditions will affect approximately 703 residential structures. Total damage range from approximately $2.2 million for the 10-year flood to $19.2 million for the Standard Project Flood (SPF) with average annual equivalent damage being approximately $1,157,600. Residences, commerce, and public facilities are, in that order, the most affected land uses.

The recommended plan consists of two segments of levees with a total length of approximately 3,300 meters, a 60 meters pilot channel, and interior drainage facilities. The plan protects the southwest portion of Aguadilla and the community of Espinar in Aguada. The plan is design to protect against the 100-Year flood and would reduce 87 percent of the total annual flood damage. This plan maximizes the net national economic development benefits. The total first cost of the recommended plan is approximately $4,548,000 with total annual cost estimated at $311,500. Since total annual benefit is $1,198,000, the implementation of the project would result in a benefit to cost ratio of 3.8/1.0. Under the current cost-sharing policy the Federal Government cost would be $2,410,600 while the non-Federal share would amount to $2,137,400.

LIST OF APPENDICES

CONVERSION FACTOR TABLE

LENGTH

1 kilometer = 0.6214 mile
1 meter = 3.2808 feet
1 centimeter = 0.3937 inch
1 millimeter = 0.03937 inch

AREA

1 square kilometer = 0.3861 square mile
1 square kilometer = 247.1054 acres
1 hectare = 2.4711 acres
1 square meter = 1.1960 square yards
1 square meter = 10.76 square feet
1 "cuerda" = 3,930.39 square meters
= 0.9712 acres

VOLUME

1 cubic meter = 1.3080 cubic yards
1 cubic meter = 35.3147 cubic feet

VELOCITY

1 meter per second = 3.2808 feet per second

FLOWRATE

1 cubic meter per second = 35.3147 cubic feet per second
1 cubic meter per second = 22.8241 million gallons per day (mgd)
1 liter per second = 0.1353 cubic feet per second

WEIGHT

1 metric ton = 2204.622 lbs.
1 metric ton = 1.1023 short tons

ABBREVIATIONS AND ACRONYMS

CBIA	Coastal Barrier Improvement Act
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resources System
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
EA	Environmental Assessment
DNER	Department of Natural and Environmental Resources
DPR	Detailed Project Report
EFIP	Emergency Flood Insurance Program
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIA	Federal Insurance Administration
HAER	Historic American Engineering Record
HQUSACE	Head Quarters United States Army Corps of Engineers
HTW	Hazardous and Toxic Wastes
LERRD	Lands, Easements, Rights-of-Ways, Relocations, and Disposal areas
MCACES	Micro Computer Aided Cost Engineering System
NED	National Economic Development
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic Atmospheric Administration
PCA	Project Cooperation Agreement
PRPB	Puerto Rico Planning Board
SAD	South Atlantic Division
SHPO	State Historic Preservation Officer
SPF	Standard Project Flood
USC	United States Code
USFWS	United States Fish and Wildlife Service

MAIN REPORT
AND
ENVIRONMENTAL ASSESSMENT

RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
DETAILED PROJECT REPORT

MAIN REPORT

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RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

MAIN REPORT

I. INTRODUCTION

This report presents the results of investigations into flooding and related problems resulting from the overflow of Río Culebrinas into Caño Madre Vieja at the southwest portions of the town of Aguadilla and at the community of Espinar at Aguada, Puerto Rico. The report was prepared in response to a request, from the Municipality of Aguadilla, for assistance in reducing flooding from Río Culebrinas and Caño Madre Vieja.

II. STUDY AUTHORITY

This study was authorized by Section 205 of the Flood Control Act of 1948 as amended, which states:

> *The Secretary of the Army is hereby authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed $40,000,000 for any one fiscal year, for the construction of small projects for flood control and related purposes not specifically authorized by Congress, which comes within the provisions of Section 1 of the Flood Control Act of June 22, 1936, when in the opinion of the chief of Engineers such work is advisable. The amount allotted under this Section for a project shall be sufficient to complete Federal participation in the project. Not more than $7,000,000 shall be allotted for a project at any single locality. The provisions of local cooperation specified in Section 3 of the Flood Control Act of June 22, 1936, as amended, shall apply. The work shall be complete in itself and not commit the United States to any additional improvements to insure its successful operation, except as may result from the normal procedure applying to projects authorized after submission of preliminary examination and survey reports.*

By letter dated August 21, 1989, (see enclosure 1) the Municipality of Aguadilla made formal application for a study of the Río Culebrinas and Caño Madre Vieja area under the authority cited above. A reconnaissance report was completed on March 1992, the report showed that a levee alternative to solve the flooding problem at the study area appeared to be feasible and that further detailed studies were warranted. The Division Engineer, therefore, approved the preparation of a Detailed Project Report (DPR). Funds to initiate this DPR were allocated on fiscal year 1995. The Municipalities of Aguadilla and Aguada are the local sponsors for the project.

III. STUDY PURPOSE

The primary purpose of this study is to investigate in detail the frequent flooding and related problems, caused by overflows from Río Culebrinas into Caño Madre Vieja, in the southwest portions of the town of Aguadilla and the community of Espinar in the Municipality of Aguada. The study also investigates if feasible alternatives for reducing the flooding problems exist without causing adverse impacts to the communities, the environment, and the existing infrastructure of the area, and recommends the most appropriate course of action within the Federal and Puerto Rico guidelines and regulations.

The investigations were of sufficient detail to identify the problems being experienced, determine probable future conditions, identify and evaluate possible structural and non-structural alternatives, evaluate all adverse and beneficial impacts of each alternative, determine public support for such alternatives, and recommend the best course of action.

IV. STUDY PROCESS

Section 205 Continuing Authorities studies follow a staged process, which includes the four functional planning tasks of problem identification, formulation of alternatives, impact assessment, and evaluation.

Initially, the study team reviewed previous reports, interviewed local residents and officials, and made field observations. The study process then concentrated on the formulation and development of alternatives, assessment of impacts, and relative evaluations. The activities were based on detailed technical analyses including flood plain topography, hydrology, hydraulic, and geotechnical investigations; socioeconomic analysis; biological and ecological studies; and cultural resources evaluations.

After technical studies are completed, a draft DPR and Environmental Assessment (EA) is prepared for Internal Technical Review (ITR) process and for review by South Atlantic Division (SAD), U.S. Army Corps of Engineers (USACE). Next, the draft report and environmental assessment is circulated for review by the Local Sponsors, Puerto Rico and Federal agencies, and the general public. The subsequent steps involved with project implementations are summarized below:

1. Review and approval of the final Río Culebrinas at Aguadilla and Aguada, Puerto Rico, Section 205 DPR by Commander South Atlantic Division.

2. Allocation of funds for plans and specifications.

3. Preparation of detailed Plans and Specifications.

4. Approval of the project for construction by the Office of the Assistant Secretary of the Army for Civil Works.

5. Execution of the Project Cooperation Agreement (PCA).

6. Sponsor accomplishes required acquisitions, relocations, and certifies project lands.

7. Funds allocation by Secretary of the Army for construction.

8. Advertise, award, and construction of the project.

9. Transfer the completed project over to the Sponsor for continued operation and maintenance.

V. SCOPE OF REPORT

A. Study Area

The detailed study area consists of the Río Culebrinas basin, located in the northwestern coast of Puerto Rico within the municipalities of Aguadilla and Aguada, approximately 115 kilometers west of San Juan, (See Figure 1). The main focus of the study is in the flood plain along the southwestern edge of the town of Aguadilla and the community of Espinar, where flooding is a major frequent problem.

B. Study Participants and Coordination

Coordination of this report was accomplished through numerous formal and informal meetings with various Puerto Rico and Federal agencies, the mayor of Aguadilla, the mayor of Aguada, local legislators, various interested groups, and the residents of the flood plain. Table 1 shows the participating government agencies. The investigation was thoroughly coordinated with the Municipalities of Aguadilla and Aguada, which are the local sponsors for the project.

Meetings held with representatives from the various government agencies were aimed at the collection of data necessary for the investigation and at the assessment and evaluation of impacts from the alternatives considered. A major objective of the coordination effort was to involve the local governments and citizen representatives as equal partners in the study process.

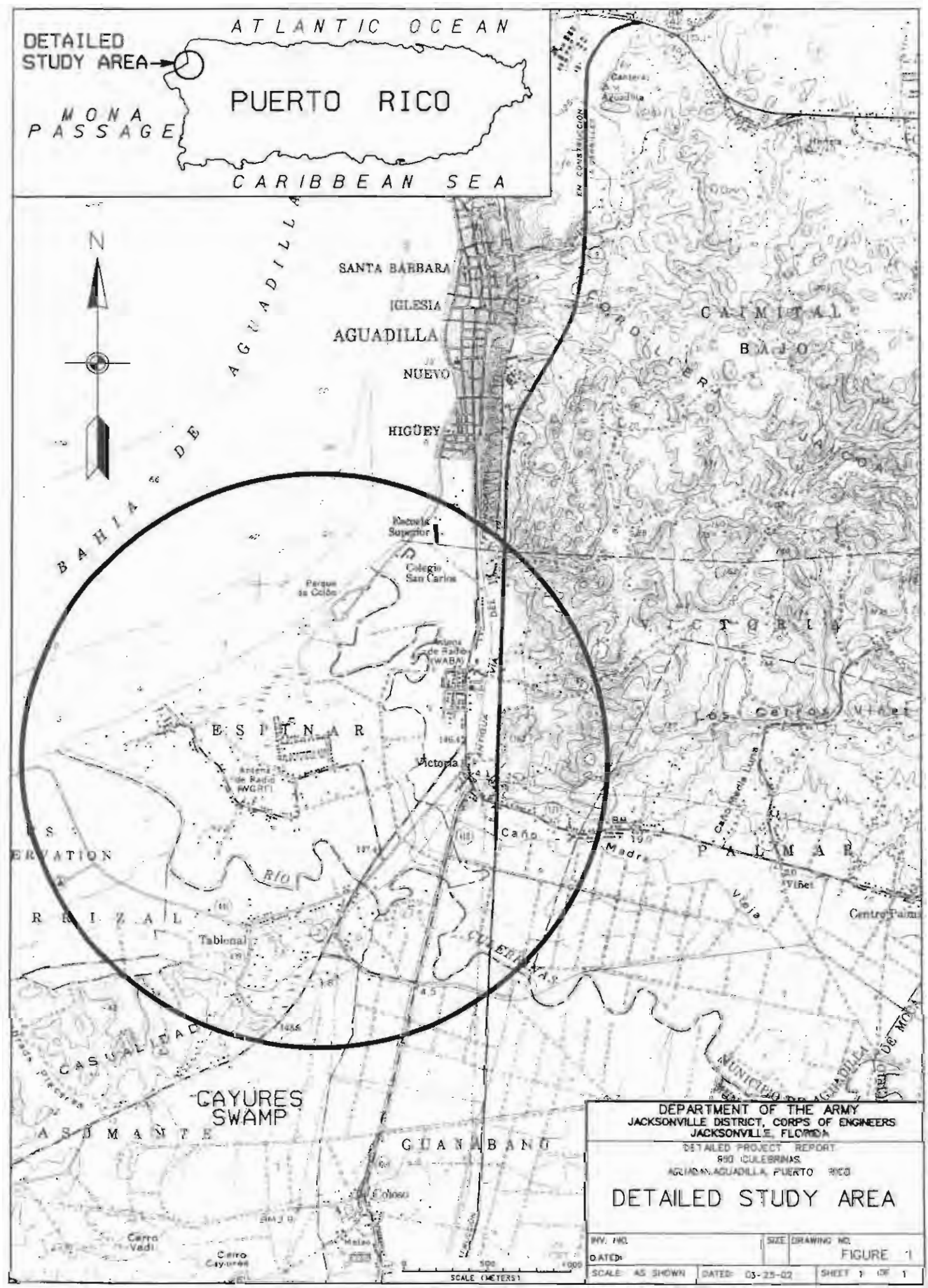

ATLANTIC OCEAN
DETAILED STUDY AREA
PUERTO RICO
MONA PASSAGE
CARIBBEAN SEA
N
SANTA BARBARA
IGLESIA
AGUADILLA
NUEVO
HIGÜEY
BAHIA DE AGUADILLA
CAIMITAL BAJO
VICTORIA
ESPINAR
Victoria
Caño Madre Vieja
PALMAR
RIZAL
Tabonal
CASUALIDAD
CAYURES SWAMP
GUANABANO
Colegio San Carlos
Parque de Colón
Los Carros
Centro Palmas
SCALE (METERS)
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
560 CULEBRINAS
AGUADA, AGUADILLA, PUERTO RICO
DETAILED STUDY AREA
INV. NO.
DATED:
SIZE
DRAWING NO.
FIGURE 1
SCALE: AS SHOWN
DATED: 03-25-02
SHEET 1 OF 1

TABLE 1

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

PARTICIPATING GOVERNMENT AGENCIES

FEDERAL	PUERTO RICO	MUNICIPAL
Department of the Interior U.S. Geological Survey U.S. Fish and Wildlife Service National Park Service Department of Transportation Federal Highway Administration Environmental Protection Agency Department of Housing and Urban Development Department of Agriculture Soil and Conservation Service Forest Service Department of Commerce National Weather Service Office of Coastal Zone Management National Marine Fisheries Service Federal Emergency Management Agency	Department of Natural and Environmental Resources Office of the Governor Planning Board Environmental Quality Board Legislature of Puerto Rico House of Representatives Senate Office of the Resident Commissioner Regulations and Permits Administration Emergency Management Agency Department of Transportation and Public Works Highways Authority Puerto Rico Ports Authority State Historic Preservation Officer Institute of Puerto Rican Culture Department of Agriculture Puerto Rico Land Authority Puerto Rico Land Administration Office of the Budget Department of Housing Department of Social Services Department of Education Department of Labor and Human Resources Police Department Puerto Rico Industrial Development Company Aqueduct and Sewers Authority Electric Power Authority Puerto Rico Telephone Company	Municipality of Aguadilla Office of the Mayor of Aguadilla Office of Community Development Office of Planning Department of Public Works Civil Defense Municipality of Aguada Office of the Mayor of Aguada Office of Planning Department of Public Works Civil Defense

C. Organization of the Report and Study Process

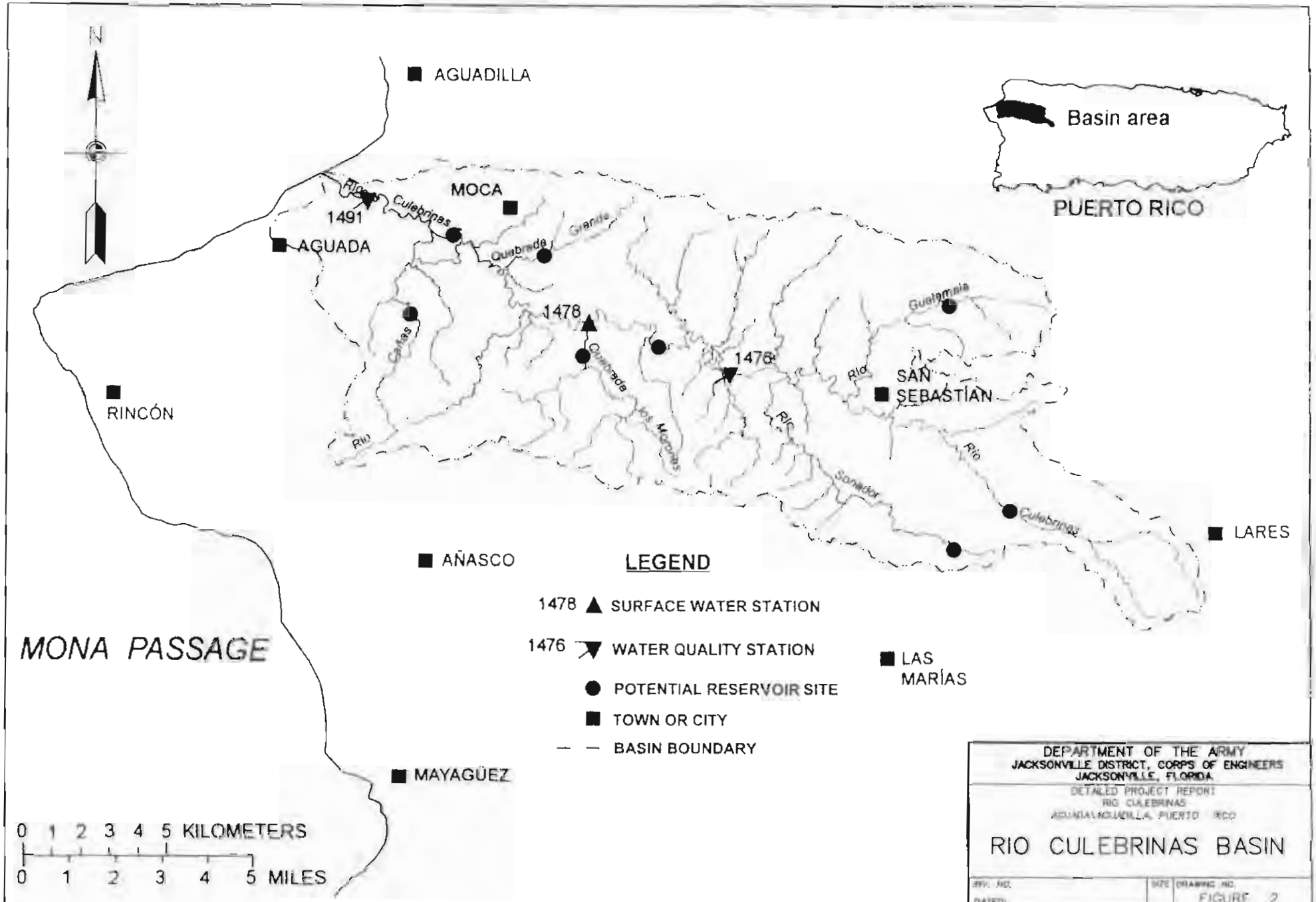
The results of these investigations are presented in a main report, and Environmental Assessment (EA), and five appendices. The main report includes the description of the river basin, analysis of the study area's flooding problems, plan formulation and evaluation process, and conclusions and recommendations of the study. The EA documents the description and analysis of the environmental resources as well as the evaluation of the potential effects that the plan of action would have on these resources and the rest of the area's human environment. The EA made reference to inputs and comments from other Federal agencies, particularly the Fish and Wildlife Service (USFWS) and the Environmental Protection Agency (EPA). The appendices present the supporting data and detailed investigations conducted as part of the study. These include: Appendix A, Hydrology and Hydraulics; Appendix B, Geotechnical Studies; Appendix C, Design and Cost Estimates; Appendix D, Economic Analysis; and Appendix E, Real Estate Plan.

VI. DESCRIPTION OF THE STUDY AREA

A. Physiography

1. The river basin. The Rio Culebrinas basin is located within the Municipalities of Lares, San Sebastian, Moca, Aguada, and Aguadilla on the northwestern coast of Puerto Rico. The Río Culebrinas basin is bordered to the north and east by the Río Guajataca basin, to the south by the Río Cuiebra and Río Grande de Añasco basins, and to the west by the Aguadilla Bay. The basin is considered a fairly gently sloping basin. A prominent feature of the basin is a 100-meter high limestone escarpment that extends along its northern boundary. There are no impounding reservoirs within the river basin. The total drainage area is approximately 267 square kilometers (103 square miles) at the mouth (See Figure 2). There may be additional drainage area in the limestone karst terrain along the northern side of the basin that cannot be precisely delineated using topographic maps.

The Río Culebrinas originates in the western part of the central mountain range of Puerto Rico at an elevation of approximately 450 meters (1,500 feet) above mean sea level. Its main tributaries are Río Guatemala, Río Caño, Río Sonador, and Quebrada Grande. The river flows in a westerly direction through the towns of San Sebastián, Moca, Aguadilla, and Aguada to discharge into the Aguadilla Bay in the Mona Passage. The total length of the river channel is approximately 44 kilometers (27.3 miles). The Caño Madre Vieja, a 2.1 kilometer (1.3 miles) distributary of Río Culebrinas, is an old river outlet that flows across the study area and discharges into the Aguadilla Bay. This small intermittent stream is the political boundary dividing the municipalities of Aguadilla and Aguada.


N
AGUADILLA
Basin area
PUERTO RICO
MOCA
1491
Río Culebrinas
AGUADA
Quebrada Granate
1478
Canas
Guatemala
1476
Río
SAN SEBASTIÁN
RINCÓN
Río
Quebrada Los Morones
Río
Río
Sonador
Culebrinas
LARES
AÑASCO
LEGEND
1478 SURFACE WATER STATION
1476 WATER QUALITY STATION
POTENTIAL RESERVOIR SITE
TOWN OR CITY
BASIN BOUNDARY
LAS MARÍAS
MONA PASSAGE
MAYAGÜEZ
0 1 2 3 4 5 KILOMETERS
0 1 2 3 4 5 MILES
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA/AGUADILLA, PUERTO RICO
RIO CULEBRINAS BASIN
FIGURE 2
SCALE: AS SHOWN
DATED: 03-29-02

2. Geology and soils. The principal soil associations found in the Río Culebrinas basin area the Voladora-Moca, Colinas-Soler, Caguabo-Múcara, and the Consumo-Humatas, in the uplands and the Coloso-Toa and Bejucos-Jobos in the lower flood plain. These soils are mostly of the "D" type, with a high runoff potential. Type "B" soils with moderate degree of drainage potential is also found within this basin. The flood plain is composed of alluvial deposits of sands, silts, clays, and gravels of various sizes.

3. Climate. According to the U. S. Weather Bureau climatological zone designations, the upper part of the basin lies within the western interior zone; the north part and the flood plain are in the northern slopes zone. Daily temperature ranges are relatively small, with a mean annual temperature ranging from 21 to 26 degrees centigrade (70 to 80 degrees Fahrenheit). Mean annual precipitation varies from 115 to 205 centimeters (45 to 80 inches).

B. Natural Resources

1. Water resources. There are significant surface and groundwater resources in the Río Culebrinas basin. The average discharge of the Río Culebrinas from 23 years of record is 8.44 cms (298 cfs or 215,900 acre-ft/yr), which is the fifth largest of all the basins in Puerto Rico. Groundwater occurs in more than one aquifer in the area, but the alluvial aquifer is the most important. Lack of adequate flow control structures limits further development of present surface water supply.

2. Coastal resources. Coastal resources within the study area include some wetlands near the mouth of the rivers, extensive agricultural coastal plains, and a long stretch of undeveloped sandy beaches designated as a Coastal Barrier under the Coastal Barrier Resources Act (CBRA) of 1982 (Public Law 97-348).

3. Environmental resources. The river valley was cleared of its original vegetation before the Twentieth Century and extensively planted with sugar cane. Sugar cane is no longer a major crop in the study area, although it is still sparsely grown near the coast. Most of the lands in the detailed study area are now fallow or unimproved pasture, but climax vegetation would be an open-crowned semi-deciduous hardwood forest dominated by the native tree úcar (*Bucida buceras*). Cattle grazing have limited tree and shrub vegetation to a few sporadic patches or riverbank stands.

The major environmental resources within the study area are the Cayures swamp near Central Coloso, the coastal barrier along the Espinar beach, and the mangrove and herbaceous wetlands near the mouth of Caño Madre Vieja. Other environmental resources include aquatic habitat within the river channel, estuarine habitat at the river mouth, the near shore saltwater habitat where the river enters the ocean, the agricultural lands adjacent to the river, and the riparian habitat within the river banks. According to the U.S. Fish and Wildlife Service (USFWS), there are no known threatened or endangered species occurring within the proposed project area.

4. Cultural resources. The Rio Culebrinas valley is a very important area in the prehistory and history of Puerto Rico. The area was inhabited throughout the Ceramic age of prehistory, demonstrated by archeological sites containing Saladoid and Ostionoid series ceramics. A nine-kilometer (5.4 mile) stretch of coastline encompassing the study area is the conjectured 1493 landing site of Columbus. Sir Francis Drake visited the area in 1595. The Iglesia de Espinar, identified as the "Ruins of the Hermitage of Immaculada Concepción of Barrio Espinar, Aguada" on the property's draft National Register form, is one of Puerto Rico's earliest churches and is located adjacent to the Espinar levee. The church was originally constructed in 1526. Numerous sugar producing haciendas and sugar processing molinos (sugar mills) were established in the river floodplain in the 19th and 20th centuries.

C. Socio-Economic Characteristics

1. General. The Municipality of Aguadilla was officially established in 1775. It covers an area of 93.2 square kilometers (23,030 acres). It is bounded to the north by the Atlantic Ocean, with the Municipalities of Isabela and Moca to the east, Municipality of Aguada to the south, and the Mona Passage to the west. It is territorially subdivided in 16 "barrios" or wards.

The Municipality of Aguada was initially established in 1510. It covers an area of 78 square kilometers (19,274 acres). It is bounded to the north by the Mona Passage and the Municipality of Aguadilla, with the Municipality of Moca to the east, Municipality of Añasco to the south, and the Municipality of Rincón and the Mona Passage to the west. It is territorially subdivided in 18 "barrios" or wards.

The Municipalities of Aguadilla and Aguada are connected to the island's primary highway system through Highway 2. Highway 115 connects the towns of Aguadilla, Aguada, and Rincón. Highway 111 connects the towns of Aguadilla, Moca, and San Sebastián. There are several second and third order highways and municipal roads linking all the "barrios" and rural communities with each other, with the town of Aguadilla, and with the neighboring towns.

The economic base of both neighboring municipalities revolves around major and diversified manufacturing activities, local tourism, trade, educational and health services. The second largest airport in Puerto Rico is located at Aguadilla's former Ramey Air Force Base.

2. Demographics. The town of Aguadilla, which is the main urban center of the study area, is a dense urban area located on the northwestern tip of the island to the north of Río Culebrinas. According to the U. S. Census Bureau, the population of the Municipality of Aguadilla totaled 59,335 persons in 1990, of which approximately 40 percent live within the urban area of Aguadilla. U.S Census Bureau estimates for July 2000, showed a 7 percent increase for a total population of 63,511 persons. The urban area includes the wards of Aguadilla Pueblo, Borinquen, Caimital Bajo, Camaceyes, and Victoria.

The Community of Espinar is a relatively large coastal rural community located in the northwestern corner of the Municipality of Aguada. According to the U. S. Census Bureau, the population of the Municipality of Aguada totaled 35,911 persons in 1990, of which approximately 4 percent 1,382 persons live in Espinar community. U.S Census Bureau estimates for July 2000, showed a 9.2 percent increase for a total population of 39,536 persons for the Municipality of Aguada of which approximately 1,582 persons live within the Espinar Community.

3. Employment and labor force. Local economy was traditionally centered around agricultural pursuits, mainly sugar cane, coffee, tobacco, minor crops, and cattle at higher ground. The sugar industry, however, as in the rest of the island, has been rapidly declining. Sugar cane is still cultivated in the flood plain and hills in the upper basin. Central Coloso is the only sugar mill still operating in Puerto Rico.

Fishing was, and still is, an important activity. Today, Manufacturing and local tourism are the most important sectors of the local economy. Ramey Air Force Base was an important source of revenue and employment during the 40 years that it was in operations. Today, the former Air Force Base houses a large residential community, several beaches, one golf course, an International Airport, many government offices and facilities, schools and universities, several commercial and industrial activities, and other military and national defense activities.

D. Future Conditions

1. Population and labor force. Considerable population and economic growth in the study area, and particularly in the towns of Aguadilla and Aguada, are expected to continue with or without a flood control project. Completion of San Juan-Arecibo Expressway (Highway 22) and ongoing improvements to Highway 2, and improvement of secondary roads would contribute significantly to this growth. The construction of new industries, shopping malls, hotels, airports, harbors, and the expansion of the services sector would stimulate further development of the area. According to projections of the Puerto Rico Planning Board (PRPB), the combined population of the municipalities of Aguadilla and Aguada are projected to increase from 95,246 in 1990 to approximately 106,200 persons by the year 2005. The total combined labor force will be concentrated in the services particularly tourist and professional services, retail trade, and government.

2. Land use. According to the PRPB land use plan for the year 1992, the land proposed for future urban expansion is mostly located east of the town of Aguadilla and to some extent southwest of the urban core, and to the south of the town of Aguada. The area has a large potential for additional industrial and residential development because of improvements to its infrastructure like the ongoing improvements to Highway 2, construction of the Aguadilla Harbor, and the utilization of former Ramey Airfield by commercial airlines.

VII. PROBLEMS, NEEDS, AND OPPORTUNITIES

A. Flooding

1. General. During flood seasons the Río Culebrinas and Caño Madre Vieja are a potential danger to the lives of the residents of the study area and are a source of frequent flood damage. Floods can occur anytime during the year; however, they are most frequent during the period of May through December. Large peak discharges resulting from storm rainfall, generally associated with the passage of hurricanes, tropical depressions and tropical waves over or near the island. Cloudburst storms can occur anytime during the year; and because of the very steep slopes in the upper basin, flash floods are another common type of event affecting this area.

There is only one principal floodable area within the watershed: the mostly confined and relatively flat Río Culebrinas flood plain between the towns of Aguada, Aguadilla, and Moca. Below Highway 115, the 100-year flood from Río Culebrinas inundates over 1,500 acres of land. The community of Espinar in Aguada is located in the middle of the flood plain between Río Culebrinas and Caño Madre Vieja (refer to Figure 1). Floods inundate all the major highways and roads in the Río Culebrinas flood plain. The entire community of Espinar is surrounded by floodwater during large floods.

2. Historical floods. Since the turn of the century there have been at least 38 large floods on the Río Culebrinas. The largest flood of record occurred in September 16, 1975 during Tropical Storm Eloise. This flood had an estimated recurrence interval of approximately 50 years. The discharge associated with this flood was estimated at 1,955 cms (69,000 cfs), and stages just downstream of Highway 2, where ground elevation average approximately 4.0 meters, reached approximately 7.2 meters (23.6 feet) above mean sea level.

The most outstanding recent floods in the Aguadilla area for which stream gaging station records exceeded 850 cms (30,000 cfs) were those which occurred during October 1972, May 1980, October 1981, May 1985, May 1986 and August 1988. There are twenty-three other large floods in the Río Culebrinas for which records at the stream gaging station exceeded 566 cms (20,000 cfs).

3. Potential floods. It is estimated that the 100-year flood would inundate over 1,500 acres of land below highway 115. The 100-year flood would cause severe flooding along the southern portions of the town of Aguadilla and inside most of the Espinar and Tablonal in Aguada. Flooding would occur along some large portions of Highway 2, Highway 115, Highway 111, Highway 418 and Highway 442 as well as flooding a large portion of the agricultural lands and industrial and commercial areas in the lower flood plain (refer to Figure 3).

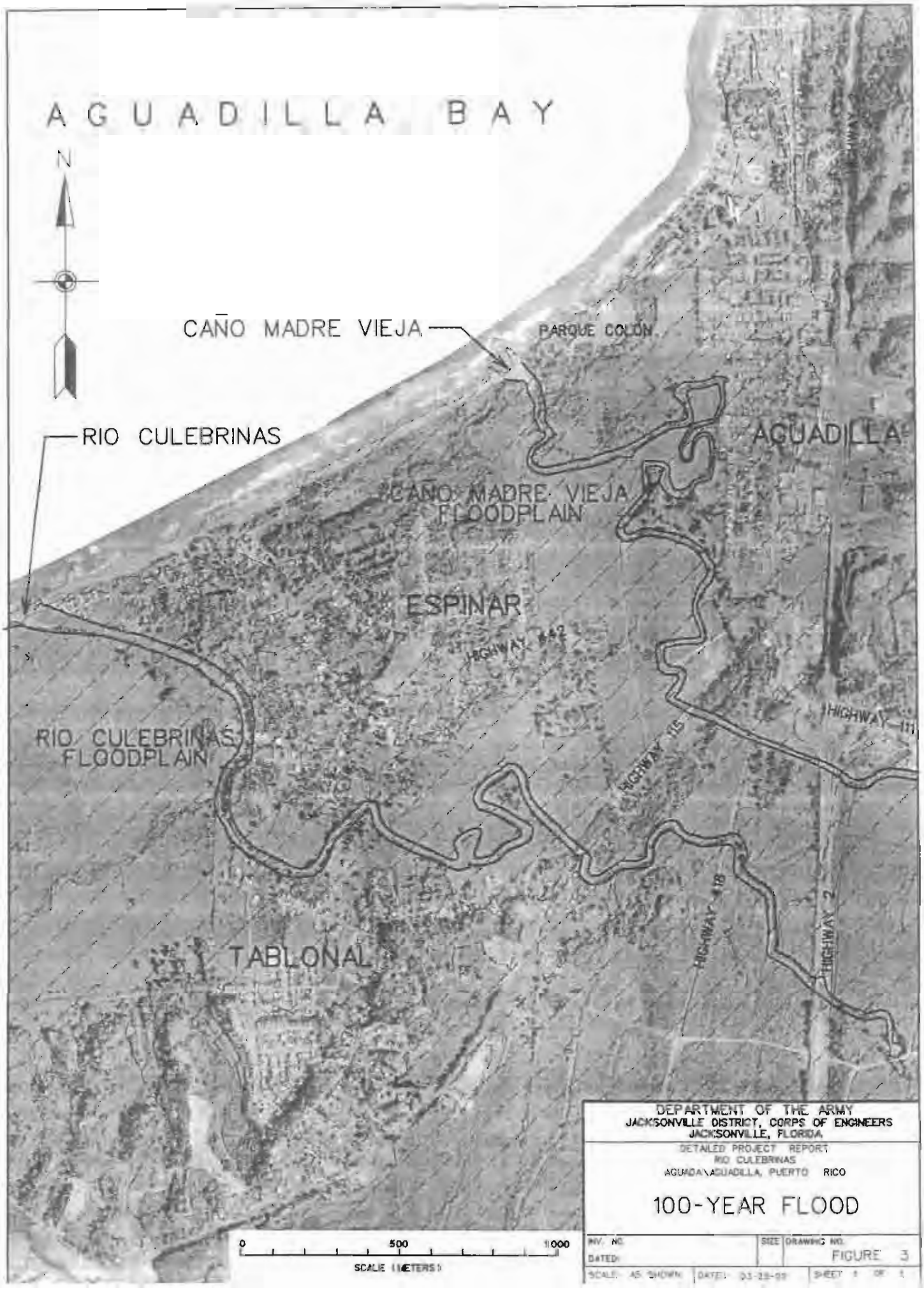
4. Floodable area. As recorded by flood records presented by the U. S. Geological Survey Floods in Aguadilla Area, Puerto Rico, Hydrologic Investigations, Atlas HA-457, 1972, the event of November 27, 1968 covered the southern portions of the town of Aguadilla and the northeast portions of Espinar in Aguada with up to two meters of floodwaters.

At the town of Aguadilla, where the average ground elevation is approximately 2.5 meters above mean sea level, the computed 100-year flood will produce an average maximum stage of 4.3 meters (14.1 feet) above mean sea level and the computed 500-year flood will produce an average maximum stage of 5.0 meters (16.4 feet) above mean sea level. Both floods will cover over 5.9 square kilometers (1,500 acres) of land below Highway 115 of which approximately 1.0 square kilometers (247 acres) have urban development (refer to Figure 3).

5. Flood damage. Under existing conditions, the floodable area is affected by two sources, Río Culebrinas and Caño Madre Vieja. The main source of residual flooding for with project condition will come from interior drainage. The inventory of the urban property subject to damage by the SPF flood from Río Culebrinas and Caño Madre Vieja included some 797 housing units, 96 commercial establishments, 49 public buildings and utilities, and 7 nonprofit establishments. Table 2 summarizes the number of structures subject to flooding for selected frequencies at Aguadilla and Espinar. Appendix E, Economic Analysis, provides a detailed description of affected property.

The 100-year flood would produce damage of $12.2 million, while the Standard Project Flood (SPF) would produce damage reaching $19.2 million. Expected average annual damage is estimated to be $1,157,500. Table 3 shows damage estimates for existing conditions by flood frequencies and land use categories.

6. Hurricane tides. Historically, the detailed study area has never been extensively flooded by hurricane or storm tides because of its location relative to the direction of winds and historical storm tracks. According to the report Storm Tide Frequency Analysis for the Coast of Puerto Rico, prepared by NOAA on August 1973, the 500-year, 100-year and 25-year storms will produce an average maximum tide of 2.7 meters (9.0 feet), 1.6 meters (5.3 feet), 0.8 meters (2.5 feet), respectively, above mean sea level.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

100-YEAR FLOOD

INV. NO.	SIZE	DRAWING NO.
DATED:		FIGURE 3
SCALE: AS SHOWN	DATE: 03-29-99	SHEET 1 OF 1

TABLE 2

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

NUMBER OF STRUCTURES SUBJECT TO FLOODING
FOR SELECTED FLOOD EVENTS
AT AGUADILLA AND ESPINAR

Flood Frequency	Aguadilla	Espinar	Total
2-Year	27	48	75
5-Year	208	56	264
10-Year	271	63	334
25-Year	363	88	451
50-Year	521	217	738
100-Year	550	293	843
SPF	561	381	942

Source: Field Survey U.S. Army Corps of Engineers.

TABLE 3

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

POTENTIAL FLOOD DAMAGE ESTIMATES
FOR SELECTED FLOOD EVENTS AT AGUADILLA AND ESPINAR
EXISTING CONDITIONS WITHOUT PROJECT
($1,000 OF 2002)

Flood Frequency	Aguadilla	Espinar	Total
2-Year	430	101	531
5-Year	774	288	1,062
10-Year	1,839	418	2,257
25-Year	3,277	682	3,959
50-Year	9,068	1,593	10,661
100-Year	10,046	2,099	12,245
SPF	13,796	5,434	19,230
AAED	938.4	219.1	1,157.6

Average Annual Equivalent Damages (AAED): $ 1,157,600

Heavy wave action occurs every year during the passage of strong cold fronts and some tropical storms. Over the years, heavy wave action induced substantial beach sand movements forming sand bars in some areas and causing severe coastal erosion in other areas.

In 1918, a very rare tsunami caused by a nearby ocean earthquake, estimated at over 8.0 Richter's Scale, destroyed many buildings and flooded the low-lying coastal areas. The earthquake and resulting tsunami caused several deaths of Aguadilla residents.

B. Water Supply

There are significant water resources potential in the Río Culebrinas watershed. There are seven potential water supply reservoir sites within the Río Culebrinas Basin (refer to Figure 2). The Puerto Rico Aqueduct and Sewer Authority (PRASA), is taking up to 17 millions gallons per day from an intake structure located just upstream from the Highway 2 bridge.

C. Water Quality

According to U. S. Geological Survey, the water from Río Culebrinas is of good quality and suitable for most purposes. Analyses of water samples collected at the Moca water quality station in May 1990 indicate that high concentrations of zinc and iron may be the most serious water quality problem. On the other hand, water quality records on groundwater are not available.

D. Erosion and Sedimentation

The central mountains of Puerto Rico are comprised of igneous and sedimentary rocks. The intensive processes of chemical weathering, which characterizes the humid tropical climate, have produced moderate and deep soil profiles, which might fail during a prolonged period of rainfall. The steep portions of Río Culebrinas basin are mostly undeveloped and are covered by a thick rain forest. There is no evidence of problems related to debris flows reaching Highway 2 during past floods. At flood stage, the Río Culebrinas carries normal amounts of sediments, which are deposited along the lower flood plain and in the Mona Passage.

E. Land Use

The topographic restrictions of the region would eventually limit the growth of the town of Aguadilla and the Espinar community. The Río Culebrinas and Caño Madre Vieja flood plain, the Aguadilla Bay, and steep slopes are physical barriers that would eventually limit the growth of the area. There is sufficient flood free land for future urban development within the study area.

F. Hazardous and Toxic Wastes

An initial HTRW assessment was conducted in May 1995 and updated in May 1999. The assessment included an investigation of the water quality and air quality potential impacts in the project area, review of available literature and documents, and site reconnaissance. The predominant land use is agricultural and poses little or no HTRW threat. No signs of potential HTRW problems were identified and no sites with potential for contamination with HTRW were found. During the development of plans and specifications or during project construction, the development of a response plan for dealing with any HTRW encountered is the exclusive responsibility of the local sponsors as stated in ER 1165-2-132 "Water Resources Policies and Authorities HTRW Guidance for Civil Works Projects", dated June 1992.

G. Flood Plain Development

Executive Order 11988 ties together the need to protect human lives and property with the need to restore and preserve all natural and beneficial flood plain values. The objective of the executive order is to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of development wherever there is a practicable alternative. The test of what is a practicable alternative depends upon the situation and includes consideration of many pertinent factors such as environment, cost, design, and construction technology.

The order is based in part on the National Environmental Policy Act (NEPA) of 1969, and it adds new prominence to the environmental aspects of flood plain management. Consideration must be given, therefore, to natural and beneficial flood plain values and to the public benefits to be derived from their restoration or preservation. Section 2(a)(2) of the order requires that if an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a flood plain, the agency shall:

1. Consider all practical alternatives to avoid effects and incompatible development in the flood plains.

2. Design or modify its action in order to minimize potential harm to or within the flood plain.

3. Prepare and circulate a notice containing an explanation of why the action is proposed to be located in the flood plain.

All flood control alternatives considered and evaluated during this study have been carefully formulated to obtain the most practical and feasible alternative in accordance with the flood plain preservation requirements dictated by Executive Order 11988. The proposed project minimizes impacts to flood plain values and does not promote development of land in the flood plain.

H. Prime and Unique Farmlands

The Farmland Protection Policy Act, implemented under the Department of Agriculture's final rule effective 6 August 1984, requires the USACE to coordinate with the Soil Conservation Service for identification of prime and unique farmland which might be impacted by the proposed project. It is within USACE discretion to proceed with a project that would result in conversion of farmland to nonagricultural uses once the potential impacts of the proposed action have been examined and alternatives to lessen the adverse effects have been considered. The final rule also requires that the project be compatible with state and local programs for the protection of farmlands.

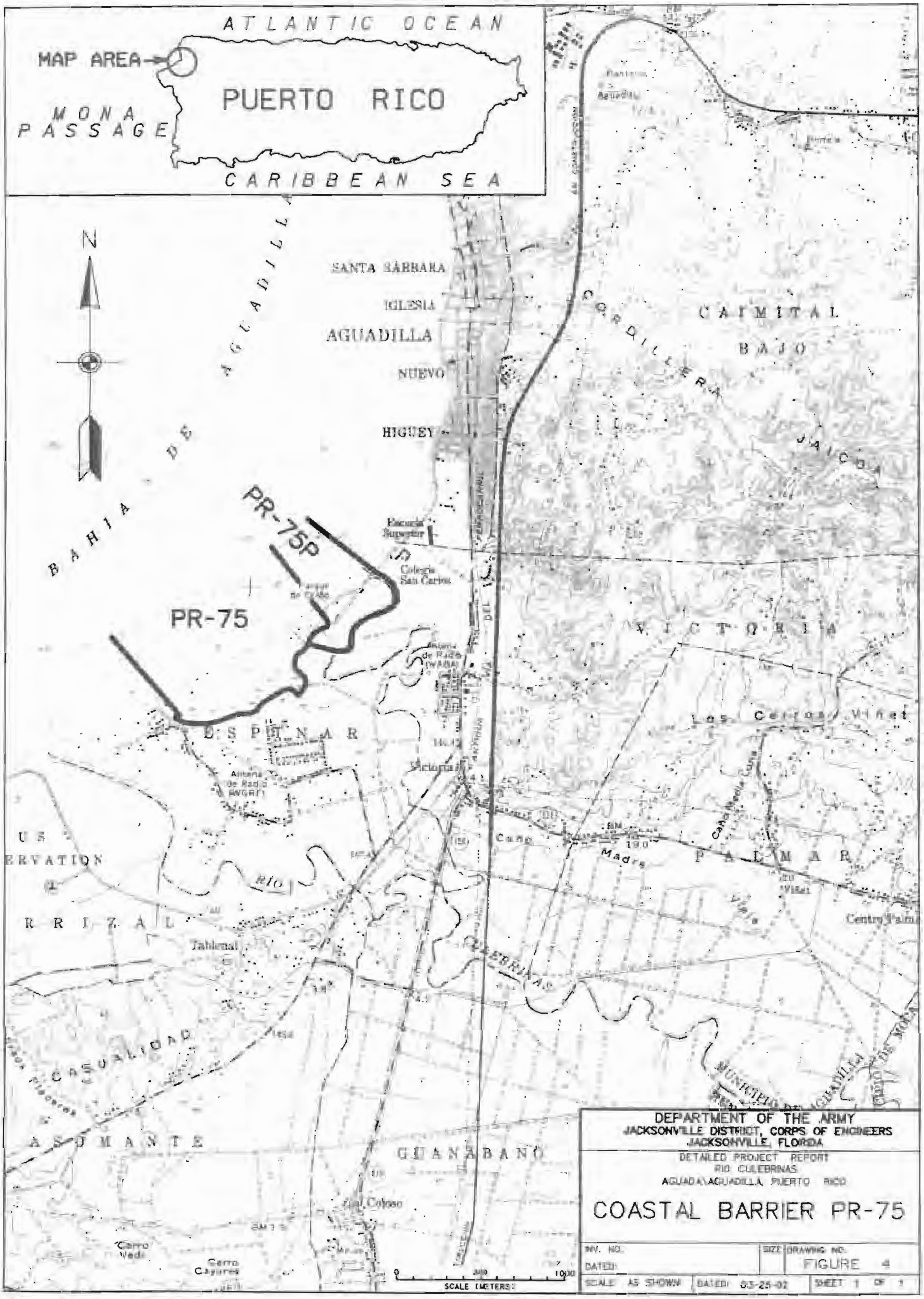
All alternatives considered and evaluated during this study have been formulated in accordance with the prime and unique farmlands preservation requirements of the Farmland Protection Policy Act. The proposed project levees and pilot channel will not impact any areas designated as prime and unique farmlands.

I. Coastal Barrier Resources

The Coastal Barrier Resources Act (CBRA), Public Law 97-348 (96 Stat. 1653; 16 U.S.C. 3501 et. seq.), enacted October 18, 1982, designated various undeveloped coastal barrier islands, depicted by specific maps, for inclusion in the Coastal Barrier Resources System (CBRS). Areas so designated were made ineligible for direct or indirect Federal financial assistance that might support development, including flood insurance, except for emergency life-saving activities. The Coastal Barrier Improvement Act of 1990 (CBIA, P.L. 101-591; 104 Stat. 2931) included in the System additional areas along the Great Lakes, Puerto Rico, the Florida Keys, the Virgin Islands, and secondary barriers within large embayments.

The undeveloped sand berm and mangrove wetlands between the mouth of Río Culebrinas and Caño Madre Vieja encompass CBRS unit PR-75 (See Figure 4). The unit extends for approximately 1 kilometer along the coast northwest of Espinar in the Municipality of Aguada. However, long before CBRA was enacted, the northeast beach end of PR-75 was subjected to significant shoreline manipulation and stabilization by the construction of two rock jetties, construction of recreation facilities, parking facilities, and the construction and maintenance of a man-made Caño Madre Vieja outlet channel. Therefore, the northeast beach end of PR-75 had experienced significant development by the time it was included in the CBRS.

Recently, a 28 acres multifamily housing development presently named "Costa de Marfil" is proposed within CBRS unit PR-75. The proposed private housing development will consist of 240 apartments, 10 luxury villas, recreation facilities, and parking facilities. The developers of the housing project have proposed to donate for permanent conservation about 12 acres of adjacent wetlands within PR-75 to DNER.


ATLANTIC OCEAN
MAP AREA
PUERTO RICO
MONA PASSAGE
CARIBBEAN SEA
N
SANTA BARBARA
IGLESIA
AGUADILLA
NUEVO
HIGUEY
BAHIA DE AGUADILLA
PR-75P
PR-75
Colegio San Carlos
ESPINAR
CAIMITAL BAJO
CORDILLERA
JAICOA
VICTORIA
Los Cerros Vinet
PALMAR
Victoria
Caño Madre Vieja
Centro Palma
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ERVATION
RRIZAL
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RIO CULEBRINAS
CASUALIDAD
ASOMANTE
GUANABANO
Cerro Cayures
SCALE (METERS)
0
500
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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO
COASTAL BARRIER PR-75
INV. NO.
DATED:
SIZE
DRAWING NO.
FIGURE 4
SCALE AS SHOWN
DATED: 03-25-02
SHEET 1 OF 1

CBRS unit PR-75P is located between the existing and the old mouth of Caño Madre Vieja (See Figure 4). Most of PR-75P is within Parque Colón, a large recreation park with several commercial and recreational structures, parking, roads, etc. Portions of PR-75P consist of wetlands along the old Caño Madre Vieja channel.

The recommended project has been carefully formulated to obtain the most practical, feasible, and environmentally acceptable flood control alternative avoiding all impacts to the CBRS.

J. Cultural Resources

Cultural resources investigations and consultation with the Puerto Rico State Historic Preservation Officer (SHPO) are in compliance with the National Historic Preservation Act of 1966 as amended (16U.S.C.470 et seq.), the Archeological and Historic Preservation Act of 1974 (16U.S.C. 469-469c) and 36 CFR Part 800. For those historic properties that will be adversely affected, mitigation plans will be developed in consultation with the SHPO. The USACE will implement the mitigation plans prior to any ground disturbing activities being initiated. Information collected during from cultural resources investigations will be reported in technical and popular reports.

K. Aesthetic Resources

The existing aesthetic resources of the Río Culebrinas area include a scrubby-edged, sandy riverbed where the watercourse is usually a shallow constant water flow. Long-range views are afforded toward the low mountains. Along the urban stretch of the river, mature trees and underbrush enclose the river behind wood and tin houses. Accumulated trash can be found in some portions of the flood plain.

The levee will provide some high relief (2.5 meters) to the west of town, and will obscure views of the flood plain. The view of the hills further to the west will not be obscured and views from the top of the levee will increase the sight distance towards them. Grassing on the levee will assist in helping it blend well along its length.

VIII. PLAN FORMULATION RATIONALE

A. General

Plan formulation involved the identification, analysis, and evaluation of various flood control management plans that addressed several planning objectives within a set of constraints, assumptions, and criteria. This report analyzes flood control alternatives to solve the flooding problem along the western edge of the town of Aguadilla and the community of Espinar in Aguada, and investigates various non-structural and structural alternatives.

B. Planning Objectives

An analysis of the study area's problems, needs, and opportunities relating to water and land related resources resulted in the identification of five important planning objectives. Of foremost importance is the solution of the flooding problem that affects Aguadilla and Aguada and threatens the lives and properties of its residents. The specific objectives identified for this study are:

1. Safeguard the lives of all residents in the flood plain.

2. Reduce property losses in the town of Aguadilla and the community of Espinar due to flooding.

3. Minimize impact on valuable natural flood plain and environmental resources within the detailed study area.

4. Enhance opportunities for redevelopment throughout the study area.

5. Protect, preserve, or minimize impacts on significant historical and cultural resources of the detailed study area.

C. Planning Constraints

The planning constraints that limit or influence the type of measures that were considered include:

1. The scope of the study is limited to the flood prone areas in the western edge of the town of Aguadilla and the community of Espinar of Aguada.

2. Physical constraints related to the proximity of the urban development to the river main channel.

3. Caño Madre Vieja Floodway encroachment by levees that may increase flood stages in the Río Culebrinas flood plain.

4. The need to construct long Highway ramps over high levees may require highway relocation or changes in levee alignment to obtain more space.

5. The need to avoid or minimize impacts to environmental and cultural resources that could be found within the project area.

D. Planning Assumptions and Criteria

Several engineering and economic assumptions and criteria were established to guide the plan formulation and evaluation process.

1. Engineering

a. Each alternative must be complete in itself.

b. High discharges, high velocities, and short time to peak require that degree of protection and type of design minimize potential for catastrophic results should project works fail.

c. The design flood is to be based on most probable future hydrologic conditions.

d. Each alternative should minimize residual flooding and damage.

e. A pilot channel was considered for Caño Madre Vieja, were the proposed levee cutoff the existing channel.

f. Earthen levees were designed to have an alignment, which would minimize floodway encroachment, minimize real estate requirements while affording sufficient area for drainage channels and internal storage of local runoff in order to eliminate the need for pumping stations.

2. Economic and financial

a. Each alternative must be justified in itself and each separate element of an alternative must be incrementally justified.

b. For purpose of optimization of net National Economic Development (NED) benefits not only are different alternatives examined, but similar alternatives are examined for different degree of protection.

c. Total beneficial contributions of each alternative considered must exceed the total adverse impacts, and one of the alternatives must maximize net NED benefits.

d. The study year is taken as 2002, the base year as 2008, and the end of the planning period as the year 2052.

E. Without Project Conditions

The without project conditions scenario would be equivalent to the no action alternative, which envisions no flood control project within the study area. Potential flood hazard to the life, health, and property of detailed study area residents would remain together with the need for additional water supply as the most critical water-related problems.

Periodic disruption of productive economic activities resulting from flooding in the detailed study area would impair further economic development of the western portions of the town of Aguadilla and the community of Espinar. Relocation of all the activities in the area seems unlikely because nowhere else are similar locations and agglomeration economies available.

The manufacturing and tourism industries are expected to remain as the most important sources of income and employment for both municipalities. The increased utilization of the excellent airports and harbors facilities, construction of the north west aqueduct, and the continued growth of the service and construction sector will also make a significant contribution to future economic development.

The without-project condition serves as a benchmark to assess and evaluate the candidate flood-control alternatives.

IX. FORMULATION OF PRELIMINARY PLANS

A. Identification of Relevant Measures

Four nonstructural and four structural measures were identified to fully or partially address the planning objectives previously identified. The non-structural measures considered are flood plain management, flood insurance, temporary and permanent flood plain evacuation, and channel maintenance. The structural measures considered included flood proofing, multipurpose reservoirs, channel improvements, and levees and/or floodwalls. All measures considered are described below:

1. Nonstructural measures.

a. Flood plain management. The most important and relevant nonstructural measure that the government of Puerto Rico has to manage development in the study area's flood-prone areas is the Puerto Rico Planning Board Regulation 13. This regulation, which predates FEMA flood plain regulations and which in 1987 was revised to make it consistent with FEMA, regulates all new developments and expansion of, or improvements to, existing developments in flood-prone areas.

To receive a construction permit in a flood-prone area a developer must establish through a detailed hydrologic and hydraulic study that his project is above the 100-year flood event or that it will not increase flood stages by more than 0.3 meters. During the past years the PRPB have denied several permits for new developments in the study area's flood plain because they do not comply with flood plain management regulations. Flood plain management regulations are assumed to be in effect under all plans. This measure will have very limited effect in reducing potential flood damage to existing development.

b. Flood insurance program. The National Flood Insurance Program (NFIP) is administered by the Federal Flood Insurance Administration (FIA), which is part of FEMA. The Puerto Rico Planning Board (PRPB) serves as the local coordinating agency for the Flood Insurance Program in Puerto Rico. Puerto Rico entered the Emergency Flood Insurance Program (EFIP) in 1972 and entered the Regular Flood Insurance Program in 1978. Puerto Rico is considered a single community by the FIA.

Flood insurance would not reduce or eliminate the flooding problem but it would serve to reimburse property owners for flood losses incurred. The measure, however, seems to have been of very limited acceptance in Puerto Rico for despite frequent and significant flood damage, less than ten percent of the families living in the flood plain have acquired the insurance. However, during recent years financial institutions have required flood insurance as a condition for mortgage approval for structures located below the 100-year base flood elevation. For structures without mortgages, flood insurance is voluntary. However, flood insurance protection it is expected to be in effect under all plans considered.

c. Temporary and permanent flood plain evacuation. Temporary evacuation of persons and personal property from flood-prone areas could be accomplished when a flood threat exists. Temporary evacuation can be very effective when operated in conjunction with reliable flood warning system and where movable, damageable objects are concerned. However, at the present time there is no flood warning system in operation for the Río Culebrinas basin. The complicated process could save many lives, but leaves no time and no additional resources for taking any measures to protect and save personal property.

Permanent evacuation of the flood plain areas could be used to reduce flood damage potential. Such a measure involves land purchase, removal of buildings and infrastructure, and relocation of population. Lands acquired in this manner could be used for parks or other purposes that would not interfere with flood flows or receive material damage from floods. The permanent relocation of hundreds of concrete housing units, and hundreds of commercial establishments in a highly urbanized area is to a large extent impractical and would have very little acceptance. Therefore, permanent evacuation is not considered any further.

d. Stream cleanup program. This measure primarily consists of removal of trash, debris, and sediments from the existing stream channel. Experience with cleanup programs in other rivers suggest that such works have the effect of restoring the natural capacity of the rivers. The cleanup programs have proved to be effective in alleviating the effects of small periodic flooding; however, they do not contribute to solve the flooding associated with intermediate and large floods. These floods are a continuous menace in the study area. Stream cleanup should be a recurring activity.

2. Structural measures

a. Flood proofing. Flood proofing is a structural change and/or adjustments, which allow floodwaters to rise around or within a structure with little or no damaging effects to the structure. Flood proofing techniques do not eliminate residual nuisance damage, loss of access, loss of business, possible utility and community interruptions, and potential danger to public health and safety. This is difficult to implement on a large number of structures and therefore is not considered any further.

b. Multipurpose reservoir. The construction of a multipurpose reservoir could reduce flood levels by holding back peak flows until downstream flood plain conditions permit a controlled release of stored floodwaters. They can also be effective in fulfilling other water resources needs such as water supply and recreation. Previous USACE studies identified several potential reservoir sites in the upper Río Culebrinas. None of the reservoir sites identified, as shown on Figure 2, would have significant flood reduction in the lower flood plain.

c. Channel improvements. Channel improvements for Río Culebrinas along a straight alignment from Highway 2 towards the ocean would provide effective flood control to the entire lower flood plain. Any type of channel improvement would require an improved outlet and some type of velocity-control measures and channel revetment. An improved outlet to the ocean would require revetments to stabilize it and perhaps also jetties to protect it from coastal sand movements.

d. Levees and floodwalls. These measures preclude floodwaters from entering damage-susceptible areas. They are considered in detail because of the physical and natural conditions of the area, and also because they appear to be the most practicable, acceptable, and efficient flood control measure for the detailed study area. Levees and floodwalls could provide considerable flood protection to the detailed study area. The physical conditions of the detailed study area are; the urban development is located to just one side of the flood plain, for most reaches there is sufficient available open space between the river and the urban area to accommodate the levee, and levee construction materials are readily available in the area. A ring levee around the community of Espinar and a levee between Caño Madre Vieja and the town of Aguadilla, investigated during the reconnaissance study, will require minimal channel relocations and minimal structure acquisitions and utilities relocations.

B. Description and Evaluation of Preliminary Plans

As described during the identification of relevant measures, the initial plan formulation considered several non-structural and structural measures. All non-structural measures examined, except permanent flood plain evacuation, are expected to be in effect under all plans considered. Because of difficult implementation, flood proofing of structures was eliminated from consideration.

The relatively small size of all the potential reservoir sites within the Río Culebrinas basin (see Figure 2) would have little effect on reducing flood stages in the lower flood plain and their cost would be over $50.0 million. Therefore, the multipurpose reservoir alternative was not considered any further.

Widening and deepening the present Río Culebrinas channel and route realignment practically throughout the lower flood plain could provide flood control to the entire coastal flood plain. The substantial channel improvements required for Río Culebrinas, in order to control major floods, could adversely impact the stream habitat of the native river shrimp and the natural water flow into the adjacent estuary and swamp. Since the cost of the required channel work would be over $30.0 million, which is beyond the funding limitation of the Continuing Authority Program, negative net benefits, adverse impact to environmental and cultural resources in the flood plain, the channel improvement alternative was not considered any further.

Levees could provide low cost and effective flood protection to the town of Aguadilla and the community of Espinar. Therefore, flood control levee alternatives are considered the only practicable, acceptable, and efficient flood control measure for the Río Culebrinas lower flood plain. Three alternative levee alignments were developed into two preliminary plans, a short levee alignment and a twin levee alignment. The most cost effective and environmentally acceptable alignment identified during the preliminary plan formulation process would be examined in detail during the final plan formulation process.

1. Preliminary Plan 1. This alternative would consist of a single short levee from Highway 2 to the Espinar community. The levee would prevent flood from Río Culebrinas to enter and flood the Caño Madre Vieja flood plain (refer to Figure 5). This alternative would protect the entire lower Caño Madre Vieja flood plain and the urban area of Aguadilla and Espinar against the 100-year floods from Río Culebrinas.

The average levee height would be approximately 3 meters above natural ground. The total length of the levee would be approximately 1.1 kilometers. Drainage canals would be provided at locations were natural overland runoff would be disrupted by the levee. The drainage canals would collect and direct storm water runoff into Caño Madre Vieja and Río Culebrinas without the need for providing drainage structures through the levee. The drainage canals would be of trapezoidal cross section with 1 meter of depth, 1 meter of bottom width, and 1V on 3H side slopes. The total length of drainage canals would be approximately 1,600 meters.

The existing Caño Madre Vieja channel would be utilized mainly for local drainage. Normal daily flow to Caño Madre Vieja from upstream of Highway 2 would be maintained as under existing conditions through existing culverts placed under Highway 2. Continued use of these culverts will maintain the existing normal freshwater flow from areas upstream of Highway 2 to mangroves located near the Caño Madre Vieja outlet. The maximum flow through these culverts under the differential head caused by a 100-year flood conditions would be 27.1 cubic meters per second (957 cfs).

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DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

PRELIMINARY PLAN 1

INV. NO.		SIZE	DRAWING NO.
DATED:			FIGURE 5
SCALE: AS SHOWN	DATED: 03-25-02		SHEET 1 OF 1

This alternative would require the construction of three road ramps were the levee crosses Highways 418, 115, and 442. This alternative would not require the replacement of highway bridges. This alternative would require the acquisition of hundred of structures in the floodway at Tablonal community and hundreds of acres of flowage easements, due to an increase in flood stages in the floodway between Highway 115 and Highway 2.

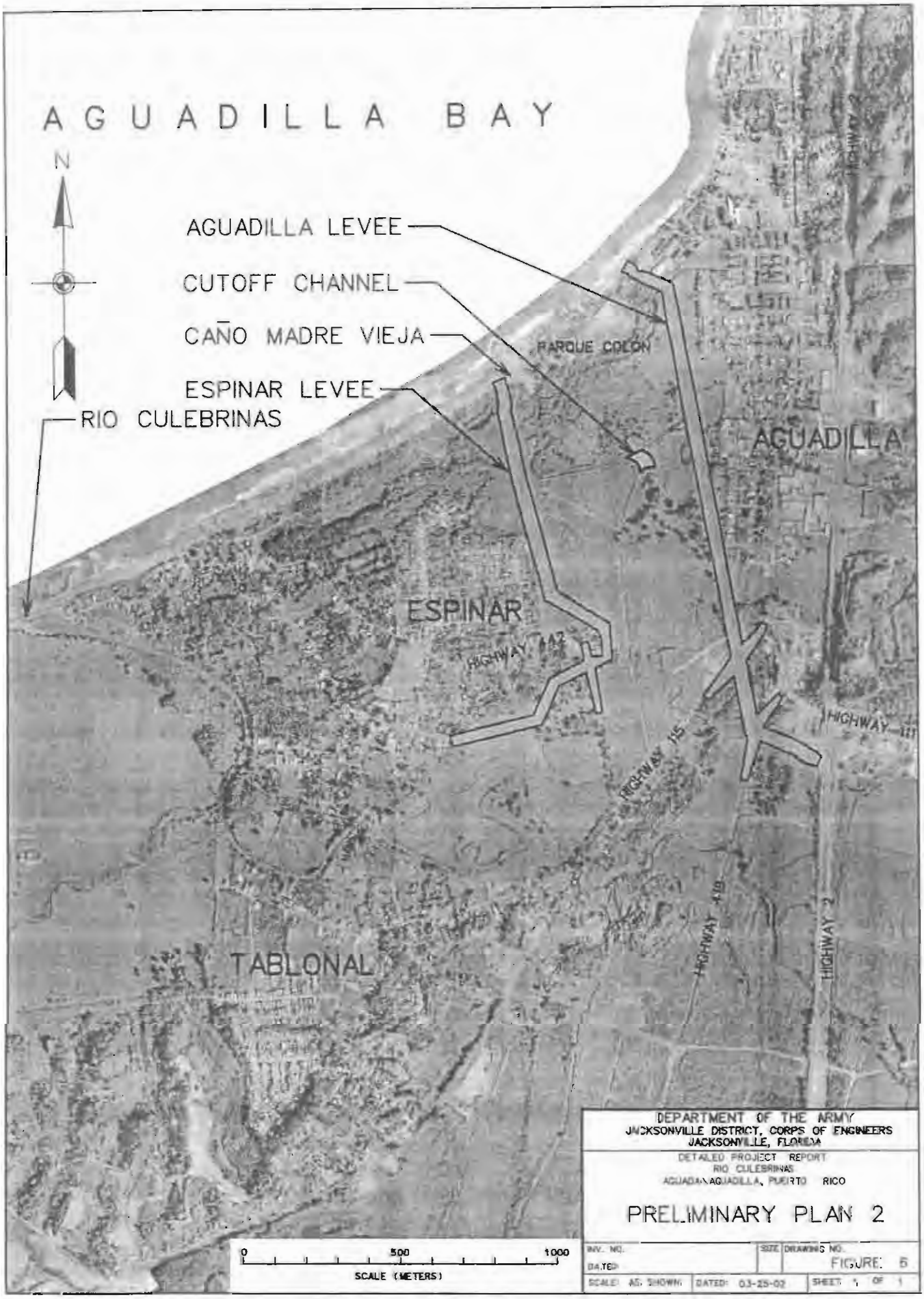
The estimated cost of this alternative is $8.0 million, of which $5.5 million are attributed to real estate cost due to an increase in flood stages. Since the real estate cost of the short levee alternative would be very high, and there would be adverse impact to residents of Tablonal community, the short levee alternative was not considered any further.

2. Preliminary Plan 2. This alternative would consist of twin levees, one protecting the urban area of southwest Aguadilla and the other protecting the community of Espinar (refer to Figure 6). The twin levee alternative would protect these two areas against the 100-year flood.

The average height of both levees is approximately 3.2 meters above natural ground. The total length of both levees would be approximately 3.3 kilometers. Drainage canals and drainage structures would be provided at locations were natural overland runoff was disrupted by the levees. The drainage canals would collect and direct storm water through the levee into Caño Madre Vieja by drainage structures consisting of 72 inch corrugated metal culverts with flap gates. The drainage canals would be of trapezoidal cross section with 1 meter of depth, 1 meter of bottom width, and 1V on 3H side slopes. The total length of drainage canals would be 3,100 meters. The vacant lands behind the levees would provide temporary storage for the 25-year storm water during high tail water caused by flood from Río Culebrinas.

A Caño Madre Vieja pilot channel would be required to accommodate the levee along the edge of the urban area without the acquisition of any existing structures. The pilot channel would be of trapezoidal cross section with 4 meters of depth, 43.2 meters width, and 1V on 3.5H side slopes. All unsuitable excavated material from the channel would be used as topsoil on the levees. The total length of the pilot channel would be approximately 60 meters.

This alternative would require the construction of three road ramps were the levee crosses Highways 418, 115 and 442. This alternative would not require the replacement of any bridges. This alternative would not require the acquisition of structures. The preliminary cost of this plan is $4.1 millions, net benefits of approximately $300,000, and a benefit to cost ratio of 2.0.


AGUADILLA BAY
N
AGUADILLA LEVEE
CUTOFF CHANNEL
CAÑO MADRE VIEJA
ESPINAR LEVEE
RIO CULEBRINAS
PARQUE COLON
AGUADILLA
ESPINAR
HIGHWAY 442
HIGHWAY 115
HIGHWAY 111
HIGHWAY 419
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DEPARTMENT OF THE ARMY
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JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA & AGUADILLA, PUERTO RICO
PRELIMINARY PLAN 2
INV. NO.
DATED
SIZE
DRAWING NO.
FIGURE 6
SCALE: AS SHOWN
DATED: 03-25-02
SHEET 1 OF 1

X. DESCRIPTION AND ANALYSIS OF FINAL PLANS

A. General.

Based on the results of the preliminary plan formulation, the twin levee alternative is the only practical, acceptable, and feasible flood control alternative that warrants to be examined in detail as part of the final plans.

To facilitate the identification and description of the final plans and the recommended plan, the twin levee alternative was divided in two sections, the Aguadilla Levee and the Espinar Levee.

B. Description of Final Plans.

1. Plan 1. This alternative plan combines 3.3 kilometers of levees, a small pilot channel, three road ramps, and interior drainage facilities protecting the southwestern section of the town of Aguadilla and the community of Espinar, in Aguada, against the 50-Year flood from Río Culebrinas. The general right-of-way alignment and features of plan 1 are similar to the recommended plan and are shown in Figure 8.

The Aguadilla Levee would begin at high ground near Highway 2 and extend towards the north for approximately 1.8 kilometers to end at high ground near Yumet Avenue. A 4 meters deep and 43.2 meters wide Caño Madre Vieja cutoff channel would be constructed at Caño Madre Vieja to reconnect a stream meander to be obstructed by construction of the Aguadilla Levee. The Espinar levee would begin at high ground on the southern end of the Espinar Community and extend to the east and then to the north for approximately 1.5 kilometers to end at an existing rock jetty just south of the existing mouth of Caño Madre Vieja. Both levees would have an average height of 1 meter, 1 on 2.5 side slopes, and a levee crest of 3 meters. The interior drainage facilities would consist of a 1 meter deep and 7 meters wide drainage channel along the protected side of each levee. One two-way drainage structure would be constructed near the north end of the Espinar Levee and three one-way drainage structures would be constructed along the Aguadilla Levee. Drainage structure outlets would be connected to Caño Madre Vieja.

2. Plan 2. This plan considers the same project features as described for Plan 1, but it provides a 100-year level of protection levee. The proposed 100-year levee would have an average height above ground of approximately 2.5 meters, 1 on 2.5 side slopes, and a levee crest of 3 meters. The general right-of-way alignment and features of plan 1 are the same as those of the recommended plan and are shown in Figure 8.

3. Plan 3. This plan considers the similar Aguadilla Levee features as described for Plan 1 and Plan 2, but it provides protection for the Standard Project Flood (SPF). The proposed SPF Espinar Levee alignment would be much longer than the levee alignment considered for Plan 1 and Plan 2.

The SPF levee alignment would begin north of the mouth of Rio Culebrinas and extend to the south, to the east, and then to the north, around the community of Espinar, for approximately 3.3 kilometers to end just south of the existing mouth of Caño Madre Vieja. The proposed SPF levee would have an average height above ground of approximately 3.0 meters, 1 on 2.5 side slopes, and a levee crest of 3 meters. The general alignment and features of this plan are shown on Figure 7.

C. Analysis of Final Plans

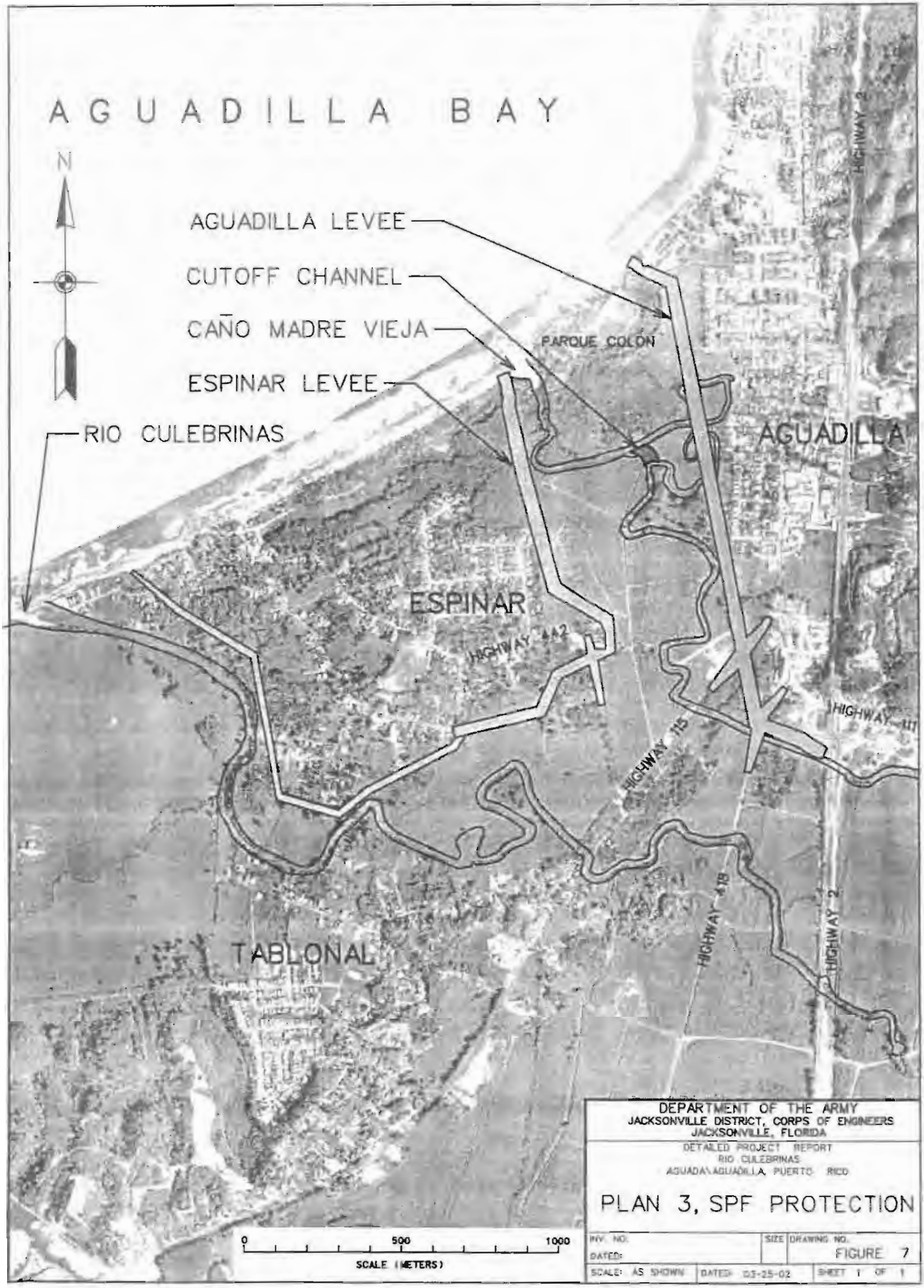
1. General. The purpose of this analysis is to arrive at a recommended plan on the basis of the contributions of the final plans to the planning objectives and the trade-offs among the alternative plans. Table 4 is a summary of the benefits and costs as well as environmental and social impacts for each final plan.

2. Plan 1. This alternative would eliminate the frequent flooding problem in the detailed study area. The construction of a 50-Year levee, interior drainage facilities, and pilot channel would take approximately 38 acres of lands and would require approximately 95,000 cubic yards of fill of which approximately 32,000 cubic yards would come from the pilot and drainage channels and the rest from the commercial borrow site at Tablonal Quarry. This alternative would provide flood protection for approximately 247 acres of urban area. The recommended plan would not provide flood protection to vacant lands in the flood plain. There would be temporary adverse impacts on air quality, water quality, and aquatic life from clearing, excavating and compacting materials during the construction of levees and channels. No net loss of wetlands is expected and no significant cultural resources sites will be impacted by the recommended project.

3. Plan 2. This plan would have the same features and impacts as Plan 1, except that the flood protection afforded would be greater, and temporary and permanent impacts would be similar because of the similar levee footprint.

4. Plan 3. This plan would have the same features and impacts as Plan 1, except that the flood protection afforded would be greater, and temporary and permanent impacts would be similar because of the similar levee footprint.

5. No Action. The no-action plan supposes continued suffering of many study area residents. A "no-action" plan would require acceptance of approximately $830,680 in average annual damage to existing properties. This would not be acceptable to the residents of Aguadilla and Aguada. The "no-action" plan would result in a physical deterioration of the detailed study area and would seriously undermine its potential for further economic development. Inhabitants of the area would continue to suffer social and economic stresses associated with frequent flooding. Continuous government relief would be necessary to help the victims of the frequent flooding in the area.



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
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DETAILED PROJECT REPORT
RIO CULEBRINAS
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PLAN 3, SPF PROTECTION

INV. NO.		SIZE	DRAWING NO.
DATED:			FIGURE 7
SCALE: AS SHOWN	DATED: 03-25-02		SHEET 1 OF 1

TABLE 4

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

SUMMARY OF COMPARATIVE IMPACTS FOR FINAL PLANS
(Figures in $1,000 of 1999)

	PLAN 1 50-YEAR	PLAN 2 100-YEAR	PLAN 3 SPF	NO ACTION
I. National Economic Development Effects				
A. Value of Increased Output of Goods and Services (Annual)				
Inundation Reduction Benefits	637.0	726.0	831.0	0.0
B. Value of Resources Required for the Plan				
Total First Cost	3,872.0	3955.0	6047.0	0.0
Interest During Construction (6.625%)	124.0	127.0	205.0	0.0
Total Investment Cost	3996.0	4082.0	6252.0	0.0
Annual Investment Cost (6.625%)	276.0	282.0	431.0	0.0
Annual Operations and Maintenance	20.0	20.0	25.0	0.0
Total Annual Cost	296.0	302.0	456.0	0.0
Net Benefits Effects (Annual)	341.0	424.0	375.0	0.0
Benefit/Cost Ratio	2.2	2.4	1.8	0.0

TABLE 4 (Cont.)

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

SUMMARY OF COMPARATIVE IMPACTS FOR FINAL PLANS
(Figures in $1,000 of 1999)

	PLAN 1 50-YEAR	PLAN 2 100-YEAR	PLAN 3 SPF	NO ACTION
II. Environmental Effects				
A. Cultural	Archeological deposits associated with the Iglesia de Espinar and deposits at PCI Site 1 will be adversely affected. Archeological data recovery will be undertaken to mitigate adverse effects. The old church ruins will be protected by the project from future flooding. A Phase II archeological assessment will be conducted at PCI Site 2.	Same as Plan 1.	Same as Plan 1.	None.
B. Flora and Wetlands	Project area is pasture lands on former sugar cane fields. No significant impact to flora. No net loss of wetlands.	Same as Plan 1	Same as Plan 1	None.
C. Fauna Avian and Fisheries	No significant impact.	Same as Plan 1.	Same as Plan 1.	None.
D. Federal Threatened and Endangered Species	None in the area.	Same as Plan 1.	Same as Plan 1.	None.
E. Noise	Temporary noise level increased during project construction.	Same as Plan 1.	Same as Plan 1.	None.
F. Water Quality	Temporary increase in river water turbidity during construction.	Same as Plan 1.	Same as Plan 1.	None.
G. Water Supply				None.
Surface Water	No significant impact.	Same as Plan 1.	Same as Plan 1.	None.
Ground Water	No significant impact	Same as Plan 1.	Same as Plan 1.	None.

TABLE 4 (Cont.)

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

SUMMARY OF COMPARATIVE IMPACTS FOR FINAL PLANS
(Figures in $1,000 of 1999)

	PLAN 1 50-YEAR	PLAN 2 100-YEAR	PLAN 3 SPF	NO ACTION
H. Coastal Barrier Resources System	The Espinar Levee alignment would impact a small portion of CBRS PR-75. The recommended plan levee would be modified to avoid any impacts to CBRS PR-75.	Same as Plan 1.	Same as Plan 1.	None.
I. Land Use	Requires about 38 acres of land for levees and channels, about 6 acres for borrow areas.	Requires about 42 acres of land for levees and channels, about 6 acres for borrow areas.	Requires about 80 acres of land for levees and channels, about 8 acres for borrow areas.	None.
J. Excavated Material	About 32,000 c.y. excavated from pilot and drainage channels and 95,000 c.y. excavated from borrow areas.	About 32,000 c.y. excavated from pilot and drainage channels and 110,000 c.y. excavated from borrow areas.	About 45,000 c.y. excavated from pilot and drainage channels and 150,000 c.y. excavated from borrow area.	None.
III. Social Well-Being				
A. Life, Health, and Safety of Residents	Will protect 3,300 persons.	Same as Plan 1.	Same as Plan 1.	None.
B. Cohesiveness	Maintains cohesiveness & prevents disruption of family life in the detailed study area.	Same as Plan 1.	Same as Plan 1.	None.
C. Urbanization	No induced development of the flood plain. Protects 247 acres of existing urban area.	Same as Plan 1.	Same as Plan 1.	None.
D. Reduction in Property Losses(in percent)	77	87	100	0
E. Residual Flooding (in $1,000 annual)	194.0	105.0	0	831.0

D. Optimization of NED Benefits

As shown in Table 4 the plan maximizing the net NED benefits is Plan 2, which provides 100-year protection. This plan is selected as the recommended plan among three other similar structural plans offering different levels of flood protection and the no-action plan.

XI. RECOMMENDED PLAN

A. Description of Proposed Improvements

1. General. The recommended plan combines 3.3 kilometers of levees, a small pilot channel, three road ramps, and interior drainage facilities protecting the southwestern section of the town of Aguadilla and the community of Espinar, in Aguada, against the 100-Year flood from Río Culebrinas. The recommended plan is the National Economic Development (NED) plan.

The Aguadilla Levee would begin at high ground near Highway 2 and extend towards the north for approximately 1.8 kilometers to end at high ground near Yumet Avenue. A 4 meters deep and 43.2 meters wide Caño Madre Vieja cutoff channel would be constructed at Caño Madre Vieja to reconnect a stream meander to be obstructed by construction of the Aguadilla Levee. The Espinar levee would begin at high ground on the southern end of the Espinar Community and extend to the east and then to the north for approximately 1.5 kilometers to end at an existing rock jetty just south of the existing mouth of Caño Madre Vieja. Both levees would have an average height of 2.5 meters, 1 on 2.5 side slopes, and a levee crest of 3 meters. The interior drainage facilities would consist of a 1 meter deep and 7 meters wide drainage channel along the protected side of each levee. One two-way drainage structure would be constructed near the north end of the Espinar Levee and three one-way drainage structures would be constructed along the Aguadilla Levee. Drainage structure outlets would be connected to Caño Madre Vieja. Drainage channels would reconnect cutoff sections of Caño Madre Vieja and would provide 8.6 acres of additional open water.

The recommended plan would substantially reduce the flooding problem in the detailed study area. The construction of a 100-Year levee, interior drainage facilities, and pilot channel would take approximately 19.6 acres of lands and would require approximately 110,000 cubic yards of fill of which approximately 32,000 cubic yards would come from the pilot and drainage channels and the rest from the commercial borrow site at Tablonal Quarry. The plan would provide flood protection for approximately 247 acres of urban area. The recommended plan would not provide flood protection to vacant lands in the flood plain. There would be temporary adverse impacts on air quality, water quality, and aquatic life from clearing, excavating and compacting materials during the construction of levees and channels. No net loss of wetlands is expected and no significant cultural resources sites will be impacted by the recommended project.

The general right-of-way alignment and features of the recommended plan are shown in the attached Figure 8. Typical cross sections for the recommended plan are shown on Figure 9.

2. Design considerations

a. Access during construction. Existing town streets, state highways and agricultural roads in the vicinity of the project would provide adequate access for construction, future maintenance, and to the borrow and disposal areas. The only detour road would be for the construction of Highway 442 ramp. Highway 418 could be utilized as a detour while constructing the Highway 115 ramp and vice versa.

b. Construction methods. Excavation from the borrow areas for the construction of levees would be accomplished by bulldozer, front-end loader, or other similar types of equipment. Excess material and material unsuitable for construction would be hauled to the nearby disposal area.

c. Real estate requirements. It is estimated that right-of-way for construction of the levees, drainage channels, and pilot channel would require 42.3 acres of permanent easements, and borrow and disposal areas would require approximately 6.3 acres of temporary easements.

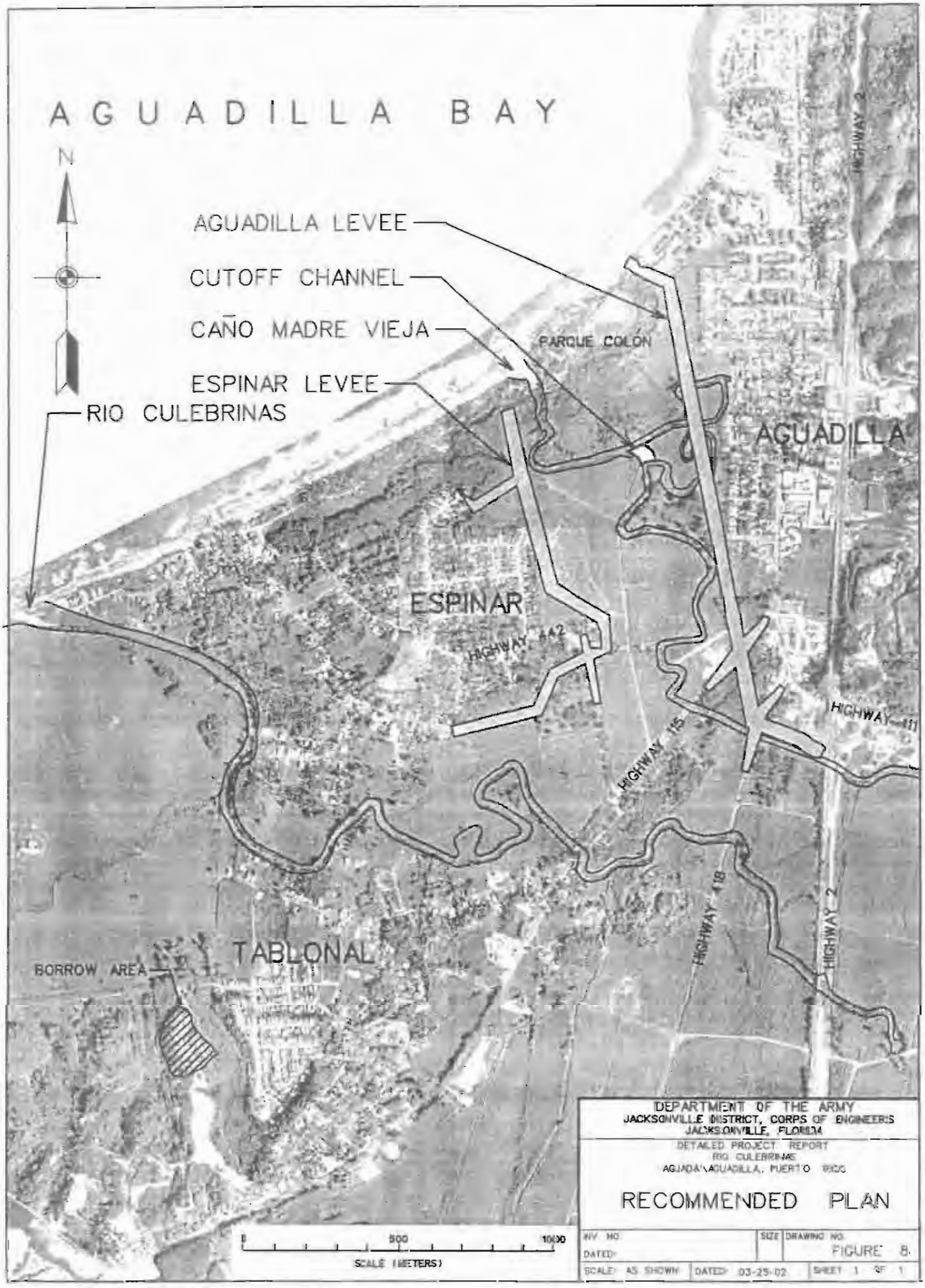
d. Operation and maintenance. The local sponsor would be responsible for maintenance of the proposed project upon completion of the construction contract. The contractor would be responsible for all maintenance during the construction contract. The annual operations and maintenance for flood control features was estimated at $15,000 a year.

B. Economics of Recommended Plan

1. General. The tangible economic justification of the recommended plan was determined by comparing the average annual charges with the estimated average annual equivalent benefits anticipated to accrue over the 50-year economic life of the project. A discount interest rate of 6 ⅛ percent was used to discount cost and benefits.

2. Cost estimate. Construction cost estimates for flood control for the proposed improvements, showing quantities and unit prices costs, are presented in Table C-1, Appendix C. Estimates of first costs were based on October 2001 price level and a construction period of 16 months. Table 5 summarizes each feature cost and the total first cost for each levee segment and for the entire project.

3. Benefits. Tangible benefits to be derived as a result of the implementation of the recommended plan result from inundation reduction benefits, redevelopment benefits, and flood insurance cost saved. The base year for project analysis was taken to be 2008.



DEPARTMENT OF THE ARMY
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JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
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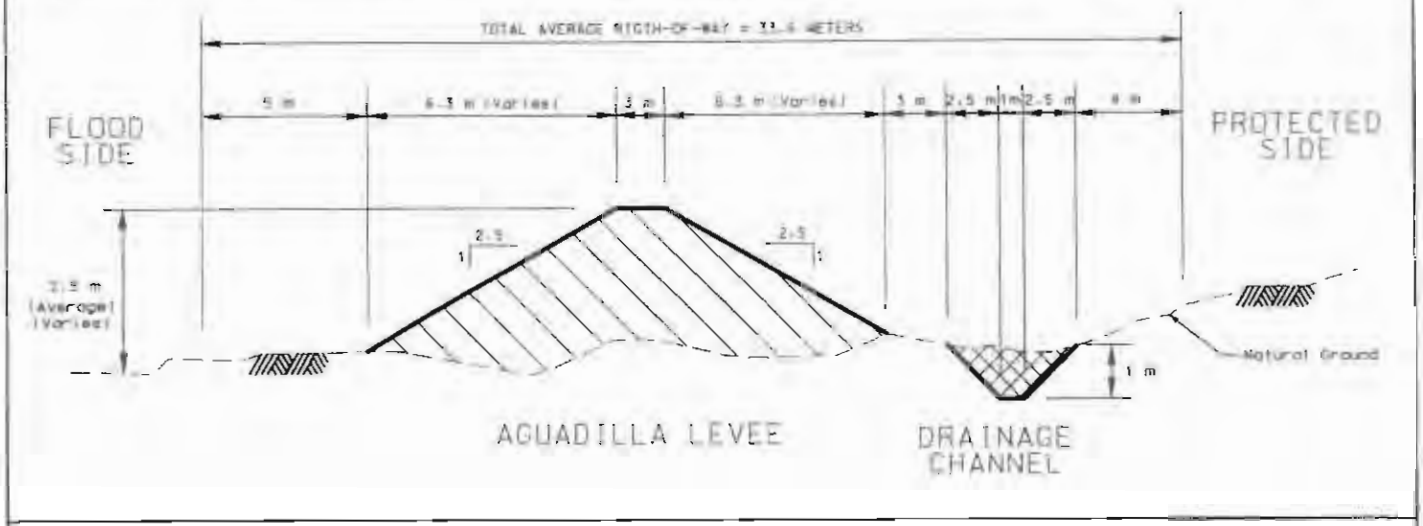
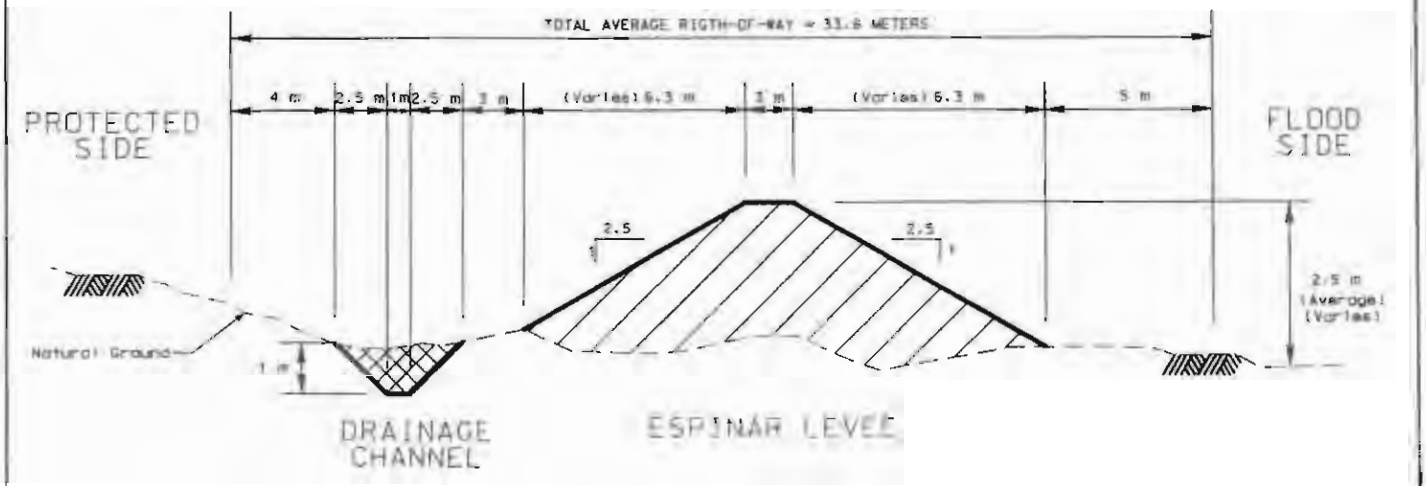
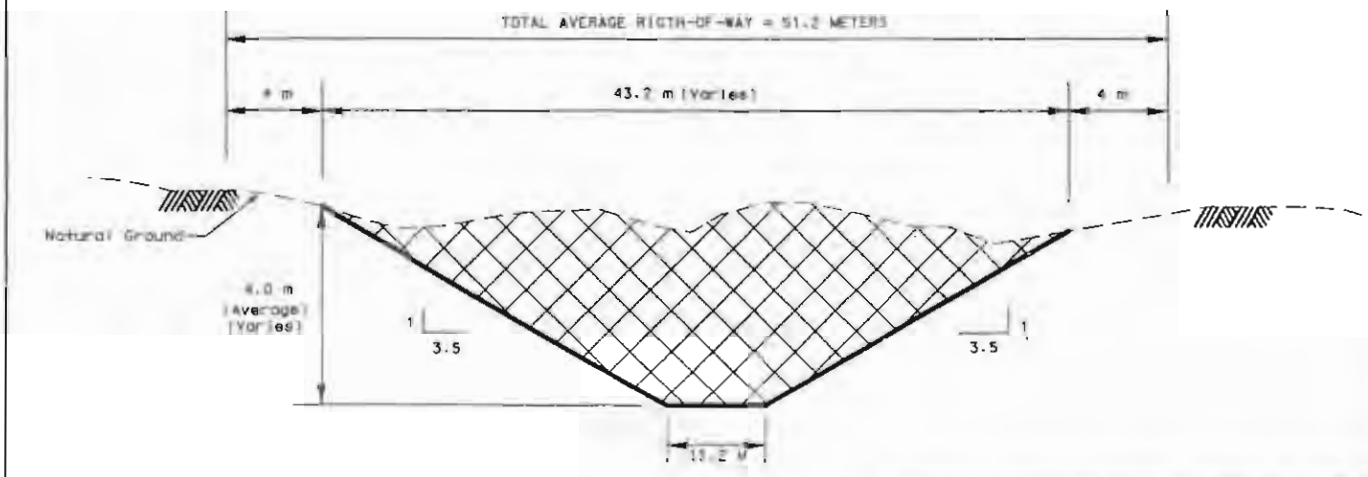
RECOMMENDED PLAN

AV. NO.		SIZE	DRAWING NO.
DATED:			FIGURE 8.
SCALE: AS SHOWN	DATED: 03-25-02		SHEET 1 OF 1







DEPARTMENT OF THE ARMY
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DETAILED PROJECT REPORT
RIO CULEBRINAS
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TYPICAL CROSS SECTIONS

REV. NO.		SIZE	DRAWING NO.
DATED:			FIGURE 9
SCALE: NTS	DATED: 03-25-02		SHEET 1 OF 1

TABLE 5

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

COSTS ESTIMATES OF RECOMMENDED PLAN
($1,000 of October 2001)

	ESPINAR LEVEE	AGUADILLA LEVEE	ENTIRE PROJECT
Roads Relocations	82.0	177.0	259.0
Utilities Relocations	0.0	39.0	39.0
Levees and Floodwalls	546.0	600.0	1,146.0
Channels and Canals	30.0	61.0	91.0
Drainage Structures	121.0	776.0	897.0
TOTAL CONSTRUCTION COST	779.0	1,653.0	2,432.0
Real Estate	814.0	798.0	1,612.0
P. L. 91-646	0.0	0.0	0.0
Cultural Resources Studies	25.0	0.0	25.0
Cultural Resources Preservation	40.0	0.0	40.0
Planning, Engineering, & Design	63.0	132.0	195.0
Construction Management	78.0	166.0	244.0
TOTAL FIRST COSTS	1,799.0	2,749.0	4,548.0

NOTES: Figures include appropriate contingency costs.
Detailed Cost estimates are shown in Appendix C.

4. Incremental Justification of Components. As shown on Table 6, net NED benefits were also computed for both levee segments that make up the recommended plan. The analysis of the two levee segments revealed that both levee segments if analyzed individually are incrementally justified.

C. Summary of Impacts

The recommended plan would substantially reduce the flooding problem in the detailed study area. The construction of a 100-Year levee and pilot channel would take approximately 42.3 acres of lands and would require approximately 110,000 cubic yards of fill of which approximately 32,000 cubic yards would come from the pilot channel excavation and the rest from the borrow area at Casualidad Hills in Aguada. The plan would protect approximately 247 square kilometers of urban area from flooding. There would be temporary adverse impacts on air quality, water quality, and aquatic life from clearing, excavating and compacting materials during the construction of levees and channels. No net loss of functional wetlands is expected and no significant cultural resources sites will be impacted by the project. Coastal Barrier Resource System PR-75 would not be impacted by the recommended levee alignment.

Table 6 shows the economic impacts of the recommended plan for each levee segment and for the entire project. MCACES cost estimates are presented in Appendix C, Design and Cost Estimates, while details on benefits are discussed in Appendix E, Economic Analysis. The benefit to cost ratio for the overall plan is 3.8 to 1.0 and net NED benefits are approximately $886,500 annually.

D. Implementation Responsibilities

1. Federal responsibility. The Federal Government would design and prepare detailed plans, and construct the project (exclusive those items specifically required of non-Federal interests). The above is subject to report approval, future-funding approval, and upon completion of a contractual agreement for local cooperation as required by Section 221 of the 1970 Flood Control Act. The maximum Federal contribution under current cost sharing policy would be $7.0 million.

2. Non-Federal responsibility. The local sponsor would be required to provide all lands, easements, and rights-of-way; alterations or acquisition of structures; alterations and relocations to highway bridges and public utilities; to hold and save the Federal Government from damage due to the construction works; and to properly maintain, replace, repair, rehabilitate and operate all works after completion of the project, including establishing and enforcing regulations, to assure the flood control project accomplishes its objectives. In addition, the local sponsor is responsible for a 5 percent minimum cash contribution and any flood control cost in excess of $7.0 million. This later figure includes cost of reconnaissance and detailed project report.

TABLE 6

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

SUMMARY OF ECONOMICS FOR RECOMMENDED PLAN
($1,000 of October 2001)

	ESPINAR LEVEE	AGUADILA LEVEE	ENTIRE PROJECT
TOTAL FIRST COST [1]	1,734.0	2,749.0	4,483.0
Interest During Construction	35.0	74.4	109.4
TOTAL INVESTMENT COST	1,769.0	2,823.4	4,592.4
Interest and Amortization	114.2	182.3	296.5
Annual Operations & Maintenance	5.0	10.0	15.0
TOTAL ANNUAL COST	119.2	192.3	311.5
Annualized Benefits			
Inundation Reduction	219.1	938.4	1,157.5
Employment	7.0	15.0	22.0
Flood Insurance Cost	8.5	10.0	18.5
TOTAL ANNUAL BENEFITS	234.6	963.4	1,198.0
Net NED Benefits	115.4	771.1	886.5
BENEFIT TO COST RATIO	2.0	5.0	3.8

1. Do not include Cultural Resources Preservation.

3. Cost sharing. Table 7 shows the cost sharing of total first cost for the project as established in the Water Resources Development Act (WRDA) of 1986, as amended by WRDA 1996. The non-Federal costs, required from the local sponsor, would be those associated with lands, easements, rights-of-way, relocations, and dredge material disposal areas (LERRD). The LERRD cost would amount to $1,910,000 for the overall plan and represent 42 percent of the total flood control cost of the project, which exceeds the minimum non-Federal sponsor contribution of 35 percent. As required by law, the non-Federal sponsor would have to contribute a minimum 5 percent in cash of the total flood control cost of the project, that is, another $220,300 in addition to the entire cost for LERRD. The Federal contribution would therefore be $2,410,600 while the non-Federal contribution would total $2,137,400 or 47 percent of the total project cost.

4. Steps to plan implementation. Submission of this report by the District Engineer constitutes the first step in a chain of events that must take place before a flood control project can become a reality. It may be modified at any stage of review, and only if it successfully passes each stage will it ultimately be constructed. These events are:

a. Review of the Río Culebrinas Detailed Project Report and the environmental assessment by Jacksonville District Independent Technical Review (ITR) and by South Atlantic Division.

b. Fulfillment of the required measures of local cooperation, including cost sharing and lands, easements, rights-of-way, acquisitions and relocations.

c. Completion of the necessary additional detailed topographic surveys, cultural investigations, geotechnical explorations, preparation of plans, specifications, and an estimate of the construction cost by the District Engineer and acquisition of required permits, followed by an invitation for bids and awarding of the construction contracts.

d. Allocation of funds by Chief of Engineers for construction.

E. Coordination

The study was developed and worked out in close coordination with the municipalities of Aguadilla and Aguada, the local sponsors; the Department of Natural and Environmental Resources, the Puerto Rico Planning Board; the State Historic Preservation Officer; the Puerto Rico Environmental Quality Board; the U.S. Fish and Wildlife Service; the U.S. Geological Survey; and the Environmental Protection Agency. After the local sponsors review the draft Detailed Project Report they would provide a Letter of Intent supporting the report conclusions and recommendations. The Draft Project Management Plan (PMP) and Project Cost Agreement (PCA) will be discussed with the sponsor during the coordination of the draft report. The Letter of Intent, PMP, and draft PCA will be included in the final report.

TABLE 7

RIO CULEBRINAS AT AGUADILLA AND AGUADA
DETAILED PROJECT REPORT

RECOMMENDED PLAN
COST SHARING OF TOTAL FIRST COST
($1,000 of October 2001)

	TOTAL	FEDERAL	NON-FEDERAL
FLOOD CONTROL ITEMS			
Levees and Channels	2,638.0	2,638.0	0.0
Roads/Utilities Relocations	298.0	0.0	298.0
Lands and Damages	1,612.0	0.0	1,612.0
TOTAL FLOOD CONTROL COST	4,548.0	2,638.0	1,910.0
5% Non-Federal Contribution		- 227.4	+ 227.4
SUBTOTAL	4,548.0	2,410.6	2,137.4
35% Minimum Contribution			1,591.8
50% Maximum Contribution			2,274.0
Contribution Adjustment	0.0	0.0	0.0
SUBTOTAL	4,548.0	2,410.6	2,137.4
Ability to Pay Adjustment	0.0	0.0	0.0
SUBTOTAL	4,548.0	2,410.6	2,137.4
TOTAL FIRST COST	4,548.0	2,410.6	2,137.4

F. Financial Analysis

During several coordination meetings with the local sponsor, the USACE field office discussed and explained the recommended plan for a flood control project along Río Culebrinas at Aguadilla and Aguada. The local sponsor understands their responsibilities for contributing with all lands, easements and right-of-ways, relocation of utilities, and the acquisition of buildings and structures necessary for the implementation of the recommended plan. The local sponsor understands the Federal requirement for contributing a minimum of 5 percent cash of the total flood control first costs. In addition, the local sponsor understands that the maximum Federal share for the project including study cost is limited to $7.0 millions.

Options for financing the local share and assessing the financial feasibility of the project were also discussed. The local sponsor has expressed their support for the recommended project and their intent to comply with all requirements as outlined in the report. Also, they presented their plan to finance their share by annual appropriations from the Puerto Rico legislature for the capital improvement program for flood control works managed by the Puerto Rico Department of Natural and Environmental Resources. These funds will be combined with funds obtained from selling of Government of Puerto Rico bonds for infrastructure development. The funds, now being programmed by the local sponsor, will cover their share of the total first cost for construction of the project in accordance with the report and latest PMP.

G. Ability to Pay

The application of the ability to pay procedures for determining a potential reduction in non-Federal cost shares for qualifying local sponsors is specified on ER 1165-2-121. The benefit test compares one fourth of the benefit to cost ratio to the normal non-Federal cost share requirement. Therefore, 3.8/4 = 0.95 or 95 percent, which is more than the maximum allowable contribution of 50 percent of the total flood control cost, as established in the Water Resources Development Act of 1986, as amended by WRDA 1996. Therefore, the local sponsor does not qualify for an additional reduction in the non-Federal share under the ability to pay provision.

H. Risk Analysis

1. General. According to CESAD-EP-PL guidance letter, dated 28 April 1995, risk analysis must be considered and addressed in final DPRs and that those DPRs already underway when EC 1105-2-205 was issued may use a descriptive evaluation when full quantitative risk analysis would impose additional cost and time. However, in July 23, 1997, the Municipality of Aguadilla, the local sponsor, requested a waiver from using risk based analysis techniques in the evaluation or design of Rio Culebrinas Flood Control project (see enclosure 3). The waiver was approved by SAD requested in accordance with Section 202 (h) (10) of the Water Resources Development Act of 1996 (see enclosure 4).

In accordance to the above guidance letter and approved risk analysis waiver, a limited risk analysis was made to examine the reasonableness of assumptions and variance of data for parameter's key to the recommended plan. Each evaluation described below revealed no major variance in the data.

2. Hydrologic and hydraulic variables. Reliability was addressed by sensitivity analyses for discharges-frequencies and stage-discharge relationships and cross section data. The hydraulic model was calibrated to high water marks from the 1975 flood event. That model was utilized for analyses of different frequency flood events for existing and post-project conditions. Levee design crests were determined as a result of two possible combinations of circumstances. First, Manning's roughness values for the channel were held to calibrated values and a 20 percent decrease in the bridges flow areas was used for the channel water surface profile. Second, the design discharge with 50 percent increase in Manning's roughness values was used for the floodway upstream from proposed channel. The 50 meters long overtopping sections are located in the downstream end of each levee between station 0+30 and 0+80. Upstream from station 0+80, a one-foot superiority was added to the levee crest elevation to ensure that overtopping would occur first at the designated location.

3. Socio-economics variables. A detailed survey of the number and types of structures in the flood plain was conducted. That information together with topographic and hydraulic data was utilized to divide the flood plain into damage reaches which were then subdivided into zones containing similar topography, land uses and type of structures. Though in each damage reach there are cases of extreme values of structures and contents at both end of the distribution, these represent less than 8 percent of the total. The structures in each reach have very similar values as they all were built following the same basic design. Families within each reach belong to the same income group. Residential developments at each reach not only have similar design but also occurred in relatively flat and leveled land with very little variation of first floor elevation from ground level. Very little variation is expected around the mean values of the socio-economic variables utilized for the damage and benefit analysis. Explicit inclusion of this variation in itself and in conjunction with the hydraulic variables described above, through risk analysis, would not alter the recommendations.

XII. CONCLUSIONS

The Río Culebrinas at Aguadilla and Aguada DPR shows that flooding is a major problem threatening life, property, and economic development in the town of Aguadilla and the community of Espinar in Aguada, Puerto Rico. It is economically justified and necessary to construct a flood control project along the Río Culebrinas. The recommended plan provides for levees and channels along the Río Culebrinas to protect over 3,300 families against the 100-Year Flood. The recommended plan proposes the following works: the construction of 3.3 kilometers of levees, a 60 meters pilot channel, and 4 interior drainage structures with drainage channels.

I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, economic, social and environmental effects. The recommended plan described in the report provides the optimum solution for flood protection along the Río Culebrinas within the framework of the formulation concepts.

XIII. RECOMMENDATIONS

I recommend that the recommended plan for flood damage reduction along Río Culebrinas be approved under the authority contained in Section 205 of the 1948 Flood Control Act, as amended, with such modifications as in the discretion of the Chief of Engineers may be advisable, be authorized for implementation as a Federal project, with such modifications as advisable at the discretion of the Chief of Engineers, for a total investment cost to the United States estimated at $2,410,600 and a benefit-to-cost ratio of 3.8 provided that, except as otherwise stated in these recommendations, the exact amount of non-Federal contributions shall be determined by the Chief of Engineers following polices satisfactory to the President and the United States Congress prior to project implementation, in accordance with the following requirements to which non-Federal interests must agree prior to implementation:.

A. Provide a minimum of 35 percent of total project costs assigned to flood control, as further specified below:

1. Provide, during construction, a minimum cash contribution equal to 5 percent of total project costs assigned to flood control.

2. Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all acquisitions and relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project.

3. Provide or pay to the Government the cost of providing all retaining dikes, waste weirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project.

4. Provide, during construction, any additional cash amounts as are necessary to make its total contribution equal to 35 percent of total project costs assigned to flood control.

5. In no instance shall the Government's share of total project cost, including all preauthorization planning (reconnaissance studies, feasibility studies, etc.), exceed $7,000,000. The local sponsor shall pay all project costs in excess of the Federal cost limitation of $7,000,000.

B. Operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, at no cost to the Government, in accordance with applicable Federal and State laws and any specific directions prescribed by the Government.

C. Grant the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

D. Hold and save the Government free from all damage arising for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project related betterments, except for damage due to the fault or negligence of the Government or the Government's contractors.

E. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs.

F. Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project.

G. Assume complete financial responsibility for necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way necessary for construction, operation, or maintenance of the recommended project.

H. To the maximum extend practicable, operate, maintain, repair, replace and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

I. Participate in and comply with applicable Federal flood plain management and flood insurance programs.

J. Prevent future encroachments on project lands, easements, and rights-of-way, which might interfere with the proper functioning of the project.

K. Not less than once each year, inform affected interests of the limitations of the flood protection afforded by the project.

L. Publicize flood plain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in preventing unwise future development in the flood plain and in adopting such regulations as may be necessary to prevent unwise future development and to ensure compatibility with the flood protection levels provided by the recommended project.

M. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, Public Law 100-17, and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

N. Comply with all applicable Federal and Puerto Rico laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Direction 5500.II issued pursuant thereto and published in part 300 of title 32, Code of Federal Regulations, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

This recommendation is made with the provision that, prior to implementation, local interest enters into a Project Cooperation Agreement with the Department of the Army to provide the items of non-Federal responsibility stipulated in Subsection D.2. of Section XI. of this report.

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 or the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before it is approved and funded by the Chief of Engineers.

James G. May
Colonel, Corps of Engineers
Commanding

RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
SECTION 205
DRAFT DETAILED PROJECT REPORT
AND ENVIRONMENTAL ASSESSMENT

ENCLOSURES

Enclosure 1

ESTADO LIBRE ASOCIADO DE PUERTO RICO
GOBIERNO MUNICIPAL DE AGUADILLA
APARTADO 1008
AGUADILLA, PUERTO RICO 00605
TELEFONO 891-1005 Exts. 223-201

August 21, 1989

District Engineer
U.S. Army Engineer District.
Jacksonville
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Sir:

In accordance with the provisions of Section 205 of the Flood Control Act of 1948, as amended, which authorizes the federal government to initiate investigations and studies to be made in the interest of flood control, the Municipality of Aguadilla hereby makes formal application for a study of a) Rio Culebrina, b) Caño Madre Vieja, c) Caño La Cacula, d) Río Subterraneo del Parterre o El Ojo de Agua.

The investigations will be conducted in two phases; the first phase is the reconnaissance study which will be funded by the Army Corps of Engineers. The Municipality of Aguadilla can provide 50 percent of the cost of the second phase, the feasibility study, and one-half of our share may consist of in-kind services.

The Municipality of Aguadilla can provide the following local cooperation and participation:

1. Provide without cost to the United States all land, easements and rights-of-way necessary for the construction of the project.

2. Provide without cost to the United States all necessary relocations and alterations of buildings, utilities, highways, bridges, sewers and related and special facilities.

3. Hold and save the United States free from damages due to the construction and subsequent maintenance of the project, except damages due to the fault of negligence of the United States or its contractors.

4. Maintain and operate the project works after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army.

5. Prevent future encroachment which interfere with proper functioning of the project for flood control.

6. Assume responsibility for all costs in excess of the federal cost limitation of $5 million.

7. Provide guidance and leadership in preventing unwise future development of the flood plain by use of appropriate flood plain management techniques to reduce flood losses.

8. Provide a cash contribution of 5 percent of the project cost.

9. If the value of the sponsor's contribution does not exceed 25 percent of the project cost, provide a cash contribution to make the sponsor's total contributions equal to 25 percent.

Hon. Ramón Calero Bermúdez
Mayor
Municipality of Aguadilla

Gobierno Municipal de Aguadilla

Apartado 1008
Aguadilla, PR 00605
Tel. (787) 891-1005

Hon. Carlos Méndez
Alcalde

July 23, 1997

Dennis R. Duke
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 1970
Jacksonville, Florida 32232-0019

Dear Mr. Duke:

I appreciate talking with your staff recently concerning the Corps of Engineer's guidance on risk and uncertainty procedures. We understand the cost increase and impact on the schedule in the event this procedure were to become part of the study process.

However, in accordance with section 202 (h) (10) of the Water Resources Development Act of 1996, we, the non-Federal sponsor for the Rio Culebrinas at Aguadilla, Puerto Rico - Detailed Project Report Study, request a waiver from using risk based analysis techniques in the evaluation or design of this flood damage reduction study.

We understand that hydraulic modeling will use modified risk and uncertainty procedures, and this degree of risk and uncertainty analysis is sufficient for our study purpose. We further understand this waiver will not impact the study schedule and cost, and will apply to all future planning and design efforts on this project.

Sincerely,

Carlos Méndez Martínez
Mayor

xc: María M. Jaunarena, Director
Office of Community Development

CESAD-ET-PL

MEMORANDUM FOR COMMANDER, HQUSACE, ATTN: CECW-P, WASH DC 20314-1000

Subject: Rio Culebrinas, Puerto Rico, Section 205 Study [091854]

1. Reference Planning Guidance Letter No. 97-3, Flood Damage Reduction Risk-Based Analysis Waiver.

2. In accordance with the policy established in the above reference, concur in Jacksonville District's request for a waiver from risk-based analysis requirements for flood damage reduction studies.

3. The sponsor's request for the waiver and the District's analysis are enclosed. The Detailed Project Report is scheduled for completion in October 1998. Completion has been slowed by the sponsor's lack of funds. Methodologies to be used in lieu of risk-based analysis including sensitivity analysis will follow engineering regulations, circulars and technical letters in place immediately prior to the implementation of the requirements in 1992.

4. Point of contact for this subject is Denver Austin, CESAJ-ET-PL, (404) 331-6739

FOR THE COMMANDER:

/s/
CARL R. POSTLEWATE
Director of Engineering
and Technical Services

Encls

DRAFT ENVIRONMENTAL ASSESSMENT

MARCH 2002

Rio Culebrinas

At Aguada and Aguadilla, Puerto Rico

Section 205
Detailed Project Report

U.S. Army Corps
of Engineers
Jacksonville District

RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
DETAILED PROJECT REPORT
ENVIRONMENTAL ASSESSMENT

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RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
SECTION 205
DETAILED PROJECT REPORT

DRAFT ENVIRONMENTAL ASSESSMENT

1.00 SUMMARY

A feasibility study of flooding in southwestern Aguadilla and Espinar ward, Aguada, has led to the proposal of a structural solution to the frequent flooding caused by overflow of Río Culebrinas into Caño Madre Vieja. The proposed project includes two earthen levees, to be built parallel to the north and south banks of Caño Madre Vieja. Other project features are: a short cutoff channel, to connect two meanders of the stream where the Aguadilla Levee will interrupt it, four drainage structures, interior drainage channels, and a borrow area located in Aguada. Additional features would include three paved road ramps across the levees. The project would require about 110,000 cubic yards of fill, of which about 30,000 cubic yards would come from the cutoff and drainage channels and the rest from the borrow site at nearby Tablonal Quarry. Levees would be earthen, between 1 to 3.6 meters high, with 1(v) on 2.5 (h) side slopes and a 3-meter wide crest. Excavated material unsuitable for levee construction would be stored temporarily on site and used to top-dress the levees after structural construction is complete. The recommended project would provide protection against 1% recurrence probability flooding (the "100 year" return frequency flood).

Impacts of the proposed project on water quality, air quality, noise, visual aesthetic resources, wildlife habitat and endangered species are expected to be minimal. The proposed project levees would cover a corner of an existing mangrove stand and small areas of palustrine emergent wetlands (wet meadows). Total projected impacts will be to 1.5 acres of emergent prairie wetlands. Project channels would create approximately 9.6 acres of new open water and emergent wetlands.

Archeological deposits associated with the Iglesia de Espinar and deposits at PCI Site 1 will be adversely affected. In coordination with the State Historic Preservation Officer (SHPO), archeological data recovery will be undertaken to mitigate adverse effects. The Iglesia de Espinar ruins will be protected by the project from future flooding. A Phase II archeological assessment will be conducted on archeological deposits at site PCI 2.

2.00 INTRODUCTION

2.01 Authority and Prior Studies. This study and proposed project were developed under the authority of Section 205 of the 1948 Flood Control Act, as amended. A reconnaissance report on flooding problems in the study area was completed in 1991. This Detailed Project Report and Environmental Assessment discuss the results of a feasibility-phase study. The study covered lands in Espinar Ward ("barrio") in the Municipality of Aguada, and Victoria Ward in the Municipality of Aguadilla. The study area is located in the northwestern part of the island of Puerto Rico. The wards are located along the south and north banks, respectively, of Caño Madre Vieja, a tributary branch of Rio Culebrinas. The recommended project would be built using Federal funding combined with funds contributed by the Municipalities of Aguada and Aguadilla, and the Puerto Rico Department of Natural and Environmental Resources (DNER).

2.02 Study Area Setting. Caño Madre Vieja is a 2.1-kilometer (1.3 miles) long tributary of Río Culebrinas, is an old river outlet of the major west slope river, Río Culebrinas that flows across the study area and discharges into Aguadilla Bay. This small intermittent stream is the political boundary dividing the municipalities of Aguadilla and Aguada. Both, the mouth of Caño Madre Vieja and the Río Culebrinas, 1.5 kilometers (0.88-mile) to the south, have sandbar restrictions. Río Culebrinas is one of the major Puerto Rican rivers, draining the northwestern limestone region around Aguadilla, as well as an extensive area of interior highlands in the vicinity of Moca, Las Marías, and San Sebastián (See Figure EA-1). The study/project area comprises low-lying lands located between the north bank of the main channel of the Río Culebrinas and the southernmost fringes of the city of Aguadilla. Both streams drain to the Aguadilla Bay. The last, coastal segment of the drainage is a wide, nearly flat floodplain bordered on the north by a limestone escarpment and the Jaicoa mountain range, and on the south by the Cadena San Francisco mountain range. The topography of the coastal part of the valley is virtually flat. "Caño Madre Vieja" is actually an old mouth of the meandering Culebrinas River, from which it branches about 2.1 km (1.3 miles) upstream of the project area. Water from the main river channel is impeded from entering Madre Vieja during low flow periods by a natural levee on the main River's north bank. When river levels rise in response to high rainfall events, this levee is overtopped and the river "spills over" into Madre Vieja channel, flooding the Espinar and Victoria neighborhoods.

The Madre Vieja Channel is itself a widely meandering stream, which carries little or no flow during dry periods, with the exception of local storm run off and local seepage from groundwater originating in the high Aguadilla limestone escarpment. The main River mouth and the Channel mouth are partially blocked during the dry season by sandbars. These bars are continually deposited by longshore sand drift, during the dry season. Rainy-season floods wash the sandbars out.

The coast in this region is a series of sandy beaches backed by a narrow, low dune berm. A long mangrove-lined slough parallels the berm behind the coastal dune. East of the mangrove stand, there are fairly extensive emergent wetlands on the Espinar side of the channel. The affected neighborhood on the north side is the Victoria ward of Aguadilla,

a long-established residential area consisting of closely spaced houses, a school and public parkland. Espinar ward of Aguada consists of more widely spaced individual residences. Lands right along the channel are former sugar cane lands, now fallow.

2.03 Problem Definition. The affected low-lying neighborhoods are flooded when heavy basin wide rainfall causes the Rio Culebrinas to rise in its coastal segment, sending floodwaters down the Madre Vieja channel. This channel also receives runoff from the high limestone escarpment located to the northeast of the project area. Flood damages occur to neighborhood houses when water enters the ground floor of these structures.

2.04 Study Goals and Objectives. The study's purpose was to develop feasible alternatives for reducing the existing flooding problems without causing adverse impacts to the communities, the environment, and the existing infrastructure of the area. Feasible alternatives are those that are cost effective, efficient and in compliance with applicable Federal and Commonwealth guidelines and regulations.

The specific goals are to protect lives, reduce property losses, avoid adverse effects on natural and socioeconomic resources of the region, and maximize net National Economic Development (NED).

3.0 DESCRIPTION OF THE PROPOSED ACTION

The proposed project action is building two flood control levees to separate the last downstream segment of Caño Madre Vieja from adjoining residential communities. The levees would extend from high ground inland on the landside of the coastal berm, north and south of Caño Madre Vieja, northwest on the high ground on both sides of the channel, to the coastal berm. The northern levee is referred to as the Aguadilla Levee, and the southern levee is referred to as the Espinar Levee. Levees would prevent recurring flooding damages. The total length of both levees would be approximately 3.3 kilometers.

The Aguadilla levee would begin at high ground near Highway 2 and extend toward the Northwest for about 1.8 kilometers to end at the high ground near Yumet Avenue. A 4 meter deep, 43 meter wide (with 4 meter right-of-way on each shore), 60 meter long Caño Madre Vieja cutoff channel would be constructed at Caño Madre Vieja to reconnect a stream meander that would otherwise be obstructed by the Aguadilla levee. Refer to Section 4.04, Recommended Plan and to Figure EA-6.

The Espinar levee would begin at high ground at the southern end of the Espinar Community and extend to the east and then to the Northwest for about 1.5 kilometers to end before reaching the Coastal Barrier Segment PR-75. A levee spur will tie at high ground in the Espinar Community. The alignment of Espinar levee was adjusted to avoid, to the maximum extent feasible, cultural resources associated with the church and ruins located in Espinar.

Both levees would have an average structural height of 2.5 meters, 1 on 2.5 side slopes, an average levee base of 16 meters, and a levee crest width of 3 meters. (The ultimate height of the levees may be greater, as it is planned to dispose of excess excavated material, if any, as top dressing on the levee crest). The interior drainage facilities would consist of a 1 meter deep and 7 meter wide drainage channel along the protected side of each levee. Total right-of–way will include 5 meters on the flooding or unprotected side and 20 meters (including the drainage channel 9 meters from the levee) on the protected side of the levee.

One one-way drainage structure would be constructed at the Espinar Levee near the levee spur to provide drainage of interior channels into Caño Madre Vieja. Three one-way drainage structures would be constructed along the Aguadilla levee to provide drainage of interior channels into Caño Madre Vieja. Drainage structure outlets would be connected to Caño Madre Vieja.

The work would require about 110,000 cubic yards of fill of which about 32,000 cubic yards would come from the cutoff and drainage channels and the rest from the commercial borrow site at nearby Tablonal Quarry (See Figure EA-6).

4.00 ANALYSIS OF ALTERNATIVES

The range of alternatives considered varied from no-action (no flood control project would be constructed) through four non-structural and four structural alternatives.

4.01 No Action. The no action alternative would allow the existing and prospective flooding condition to continue. These damages will increase in the future as residences become denser in Espinar and Victoria Wards.

4.02 Non-Structural Alternatives. Applicable non-structural measures could include channel clean-out, flood insurance, flood-proofing existing structures, relocation of flood-prone residences outside of the flood zone, strict enforcement of flood plain development regulations (Planning Board Regulation Number 13) and a flood warning evacuation systems. Some of these measures are already available.

Channel clean out is a local responsibility, but flooding in this area does not appear to be due to channel obstructions. A flood warning alarm-based systems might be feasible in large basins to protect lives from catastrophic flooding, but the relatively small size of the Río Culebrinas basin would offer no benefit from a flood warning system. Flood insurance has been available in Puerto Rico for many years, but relatively few residents participate. Flood proofing residences in this area would entail raising the inhabited part of houses above the 100 year flood level. Because most structures are of reinforced concrete or block and concrete masonry construction, this alternative would be impossible. Likewise, relocation of residences would be very costly. The Victoria sector of Aguadilla is a long-established community, with densely built housing. Thus, non-structural alternatives are either already in place (periodic clean-out, flood insurance) or not really applicable.

4.03 Structura: Alternatives. The four structural alternatives considered included flood proofing, multipurpose reservoirs, channel improvements, and levees and/or floodwalls.

The construction of a multipurpose reservoir could reduce flood levels by holding back peak flows until downstream flood plain conditions permit a controlled release of stored floodwaters. They can also be effective in fulfilling other water resources needs such as water supply and recreation. Previous USACE studies identified several potential reservoir sites in the upper Río Culebrinas. The relatively small size of all the potential reservoir sites within the Río Culebrinas basin would have little effect on reducing flood stages in the lower flood plain and their cost would be over $50.0 millions. Therefore, the multipurpose reservoir alternative was not considered any further.

Channel improvements for Río Culebrinas along a straight alignment from Highway 2 towards the ocean would provide effective flood control to the entire lower flood plain. Any type of channel improvement would require an improved outlet and some type of velocity-control measures and channel revetment. An improved outlet to the ocean would require revetments to stabilize it and perhaps also jetties to protect it from coastal sand movements. Widening and deepening the present Río Culebrinas channel and route realignment practically throughout the lower flood plain would provide flood control to the entire flood plain. Any channel improvement alternative should also include an adequate schedule for maintaining the channel free of vegetation or other obstructions. The substantial channel improvements required for Río Culebrinas, in order to control major floods, could adversely impact the stream habitat of the native river shrimp and the natural water flow into the adjacent estuary and swamp. Since the cost of the required channel work would be over $30.0 millions, which is beyond the funding limitation of the Continuing Authority Program, and will provide no net benefits, while causing an adverse impact to environmental and cultural resources in the flood plain, the channel improvement alternative was not considered any further.

Levees and floodwalls preclude floodwaters from entering damage-susceptible areas. They are considered in detail because of the physical and natural conditions of the area, and also because they appear to be the most practicable, acceptable, and efficient flood control measure for the study area. The physical conditions of the detailed study area are as follows, the urban development is located to just one side of the flood plain, for most reaches there is sufficient available open space between the river and the urban area to accommodate the levee, and levee construction materials are readily available in the area. Levees could provide low cost and effective flood protection to the town of Aguadilla and the community of Espinar. Therefore, flood control levee alternatives are considered the only practicable, acceptable, and efficient flood control measure for the Río Culebrinas lower flood plain. Three alternative levee alignments were developed into two preliminary plans, a short levee alignment and a twin levee alignment. The most cost effective and environmentally acceptable plan identified during the preliminary plan formulation process was then examined in detail during the final plan formulation process.

Preliminary Alternative 1

This alternative considers a single earthen levee from Highway 2 to the high ground at Espinar community. Alternative 1 would completely exclude flooding from the Caño Madre Vieja coastal flood plain. This alternative would protect the entire urban area of Aguadilla and Espinar against the 100-year flood, but would also deprive coastal emergent wetlands and mangroves of most of periodic riverine flooding. Refer to Figure EA-2.

This alternative would entail a levee footprint of approximately 2.33 hectares (5.76 acres) of farmland, of which approximately 1.97 hectares (4.87 acres) are in upland pastures and approximately 0.36 hectares (0.89 acres) are wet pasturelands. Secondary impacts would include the probable future elimination of approximately 31.5 hectares (77.8 acres) of agricultural lands by urban development, and potential impacts to freshwater wetlands, as well as stress to the mangroves due to deprivation of periodic fresh-water flushing. Unless there is no other practicable alternative, this alternative would violate the intent of E.O. 11988.

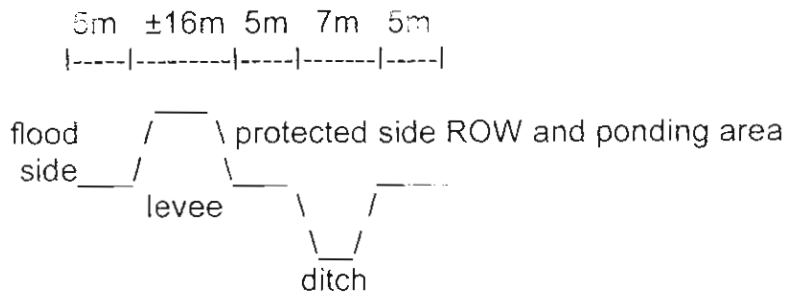
Preliminary Alternative 2

This alternative considers two levees, one protecting the urban area of Aguadilla, and one protecting the community of Espinar. This alternative would allow Caño Madre Vieja to continue acting as a floodway, while flood proofing coastal communities. The vacant agricultural land in the flood plain between the levees would not be protected. Refer to Figure EA-3.

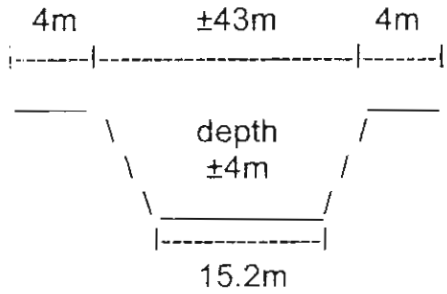
This alternative would eliminate by direct impact (footprint of the levee) approximately 4.75 hectares (11.7 acres) of farmland, of which approximately 2.2 hectares (5.4 acres) are in upland pastures and approximately 0.6 hectares (1.5 acres) are wet pasturelands (palustrine emergent wetlands). The remaining 1.95 hectares (4.8 acres) consist of uplands not dedicated to pasture lands. Based on a worst case analysis for impacts to the mangrove swamp forest, where the edge of the levee is aligned along the adjacent landowners' fence, approximately 0.2-acres (0.1 hectares) would be eliminated. This alternative would also cutoff approximately 980 meters of live stream from the Caño Madre Vieja.

To facilitate the identification and description of this alternative the two-levee alternative was divided in two sections, the Aguadilla Levee and the Espinar Levee. The Espinar Levee total right-of-way acreage, including 1 ramp, would be (1,500 meters long + 266 meters long for the Western spur) x 36 meters wide = 67,108 square meters = 16.58 acres. The Aguadilla Levee total right-of-way acreage, including 2 ramps, would be (1,800 meters long) x 38 meters wide = 68,400 square meters = 16.90 acres. As shown below, the typical levee right-of-way includes the levee and drainage channel footprint, ramps, and a maintenance easement on both sides.

1 acre = 43,560 sq. ft. or 4,047 sq. m. 1 ha = 2.47 acres or 10,000 sq.m.



Last, the Caño Madre Vieja cutoff channel would be approximately 60 meters long and 4 meters deep as shown on the typical cross section below. Permanent right-of-way covers about 60 meters long x 51 meters wide = 3,060 square meters = 0.8 acres.



Based on the preliminary plan formulation analysis, the two levee alternative is only practical, acceptable, and feasible flood control alternative that warrants to be examined in details as part of the final plans.

Final Alternative 1

This alternative combines 3.3 kilometers of levees, a small cutoff channel, three road ramps, and interior drainage facilities protecting the southwestern section of the town of Aguadilla and the community of Espinar, in Aguada, against the 50-Year flood from Río Culebrinas. The general right-of-way alignment and features of final alternative 1 are shown in Figure EA-4.

The Aguadilla Levee would begin at high ground near Highway 2 and extend towards the north for about 1.8 kilometers to end at high ground near Yumet Avenue. An approximate 60 meters long, 4 meters deep, and 43 meters wide Caño Madre Vieja cutoff channel would be constructed at Caño Madre Vieja to reconnect a stream meander to be obstructed by construction of the Aguadilla Levee. The proposed interior drainage channel would reconnect the meander interrupted by the levee. The Espinar levee would begin at high ground on the southern end of the Espinar Community and extend to the east and then to the north for about 1.5 kilometers to end just south of Coastal Barrier (CB) segment PR-75. The final plans considered a previously impacted portion of CB segment PR-75 as the northernmost tie up site for the Espinar levee. The recommended plan eliminated all

proposed work within the CB segment PR-75. This was done in order to comply with the stipulations of the Coastal Barriers Resources Act (CBRA) and the Coastal Barriers Improvement Act of 1990 (CBIA). These Acts prohibit the expenditure of Federal funds to enhance the infrastructure of a designated CB area in such a way to stimulate development of a CB. Both levees would have an average height of 1 meter, 1 vertical on 2.5 horizontal side slopes, and a levee crest of 3 meters. The interior drainage facilities would consist of a 1 meters deep and 7 meter wide drainage channel along the protected side of each levee. One two-way drainage structure would be constructed at the north end of the Espinar Levee and three one-way drainage structures would be constructed along the Aguadilla Levee. Drainage structure outlets would drain into to Caño Madre Vieja.

Final Alternative 2

This alternative considers the same project features as described for Final Alternative 1, but it provides a 100-year level of protection levees. The proposed 100-year levees would have an average height above ground of about 2 meters, 1 on 2.5 side slopes, and a levee crest of 3 meters. The general alignment and features of Final Alternative 2 are similar to Final Alternative 1 and are shown in Figure EA-4.

Final Alternative 3

This alternative considers the similar Aguadilla Levee features as described for Final Alternative 1 and Final Alternative 2, but it would be higher and wider providing protection for the Standard Project Flood (SPF). The proposed SPF Espinar Levee alignment would be twice as long, higher, and wider than the levee alignment considered for Final Alternative1 and Final Alternative 2. The SPF levee alignment would begin north of the mouth of Río Culebrinas and extend to the south, to the east, and then to the north, around the community of Espinar, for about 3.3 kilometers to end at an existing rock jetty just south of the existing mouth of Caño Madre Vieja. The proposed SPF levee would have an average height above ground of about 3.0 meters, 1 on 2.5 side slopes, and a levee crest of 3 meters. The general alignment and important features are shown on Figure EA-5.

4.04 Recommended Plan.

Final Alternative 2 with modifications to the Espinar Levee for avoiding impacts to the Coastal Barrier segment PR-75 is the recommended plan. It maximizes the National Economic Development (NED) benefits. The recommended plan combines 3.3 kilometers of levees, a small cutoff channel, three road ramps, and interior drainage facilities protecting the town of Aguadilla and the community of Espinar, in Aguada, against the 100-year flood. The general alignment and important features of the recommended plan are shown on Figure EA-6, and typical cross sections are shown on Figure EA-7.

The recommended plan would substantially reduce the flooding problems in the detailed study area. The construction of a 100-year protection levee, interior drainage facilities and a small cutoff channel would take about 19.6 acres of lands and would require about 110,000 cubic yards of fill of which about 32,000 cubic yards would come from the

cutoff and drainage channels and the rest from the commercial borrow site. The plan would provide flood protection for about 550 acres of urban area. The recommended plan would not provide flood protection to vacant lands in the flood plain, nor would it significantly affect flood flows or timing in Caño Madre Vieja.

The proposed work will entail the disposal of approximately 1,000 cubic yards of spoil fill. Most will be disposed of within the right-of-way of the levees, on top or on the sides' slopes as top soil. Any spoil fill or debris that cannot be disposed of in that manner will be disposed of in the municipal landfill in use by the municipalities of Aguadilla and Aguada at the time the work takes place.

5.00 AFFECTED ENVIRONMENT

5.01 Vegetation and Wildlife. Most of the lands in the river valley area are now fallow unimproved pasture, but much of the area was planted in sugar cane for many decades. Prior to its agricultural use, climax vegetation would have been an open-crowned semi-deciduous hardwood forest of mixed species. More recently, land use has included use as cattle pasture and for sand extraction (shallow quarrying). Cattle grazing have limited tree and shrub vegetation to a few sporadic patches or riverbank stands of facultative wetland trees. The large marsh, called Cayures Swamp, and shown on Figure EA 2) located on the south bank of the Culebrinas River in Aguada, is reportedly used by special concern species including the masked duck and possibly West Indian whistling duck, but no recent sightings of these species are known to biologists of the Commonwealth Natural Heritage ("Patrimonio") program. The recommended plan avoids work in this area.

Espinar Community is surrounded by low, nearly level flood plain lands. Much of this land, formerly planted in sugar cane, has reverted to mixed (upland) grassland and wet grassland. To its west, and south of the mouth of Caño Madre Vieja, the low sandy beach berm is backed by a narrow mangrove swamp. The berm and mangroves is a designated Coastal Barrier segment (PR-75/75P). The landward edge of PR-75 coincides with the landward (eastern) side of the mangrove wetlands in Espinar. The land North of the Caño (designated PR-75P) has been developed into a city park with recreation on commercial facilities. A wet swale extends inland from the mangrove swamp. Vegetation in the swale is a mix of wetland grasses, herbs and salt-tolerant shrubs, including *Mimosa casta, Lonchocarpus dominguensis, Machaerium lunatum*, and *Thespesia populnea*.

The area around Espinar does not support a very diverse or unusual assemblage of wildlife. The mixed pasture and emergent wetlands of Caño Madre Vieja do not appear to be significant habitat, as indicated by field observations and the Fish and Wildlife Coordination Act Report. Green-backed heron fish and rest in the mangrove, and cattle and snowy egrets visit the shallow water areas to feed. In general, wildlife consists of common lizards and frogs, human tolerant species of birds (including kingbirds, grackles, bananaquits, and grassquits), rats and mice, and mongoose. Crustaceans include fiddler crabs and the blue land crab, *Cardisoma guanumi.*

Human impact is prevalent throughout the area. Only occasional birds and crab burrows are noticeable. Other animals seen include cattle and domestic cats and dogs. No endangered, threatened, or special concern species (species listed in the DNER Natural Heritage inventory) are known from the immediate project lands.

5.02 Fishery Resources. The U.S. Fish and Wildlife Service (USFWS) identified freshwater river shrimp (*Macrobrachium carcinus*) as an aquatic species of concern and expressed concern that whatever alternative chosen, careful consideration be given to water flow which could impact the stream habitat of this migratory freshwater shrimp. Both the Río Culebrinas and Caño Madre Vieja are well known for their populations of this native river shrimp, which are caught and sold locally. However, the flood control features under consideration would not significantly affect flows or stages of either Río Culebrinas or Caño Madre Vieja and would not obstruct passage of these migratory organisms. On July 7, 1999, the USACE determined that the proposed work would take place inland of any existing designated Essential Fish Habitat (EFH) under jurisdiction of the National Marine Fisheries Service (NMFS), and would not affect it. This determination was coordinated with NMFS by letter on July 7, 1999. On August 4, 1999, NMFS stated that it had no comments or recommendations to offer. The recommended plan avoids impacts to aquatic species in the study area.

5.03 Coastal Barriers. The sandy coastal berms south and north of the mouth of Caño Madre Vieja are Coastal Barrier Segments PR-75 and PR-75P, respectively (refer to Figure EA-1). The mangrove-vegetated area along Espinar beach falls within Coastal Barrier PR-75. The coast in this region is a series of sandy beaches backed by a narrow, low dune berm, no more than 2-3 m high, and readily overwashed by storm swells. A long mangrove-lined slough parallels the berm behind the coastal dune. East of the mangrove stand, there are fairly extensive emergent wetlands on the Espinar side of the channel. Even farther East, the land rises again, and this is where the residences of Espinar ward are located. Barrier segment PR-75 is still largely undeveloped. The vegetation of the sandy berm is composed of a mix of native and exotic trees. The latter include coconut palms and tropical almonds (natives of Southeast Asia). The mangrove lined slough is fairly narrow and shallow (refer to Photos 11 and 12 of the DCAR, Attached). A 28-acres multi family housing development presently named "Costa de Marfil" is being proposed within CB segment PR-75, the proposed private housing development will consist of 240 apartments and 10 luxury villas, recreation facilities, and extensive parking facilities.

The "P" designation area near Parque Colón on the East side of the stream mouth indicates that the segment is considered protected by State or local regulations. This area is not subject to Federal restrictions. It is not known how this segment was included within the Coastal Barrier System, as it is a city park complete with a running track, public beach area, boat and passive play area dominated by several large, exotic shade trees (including one enormous fig tree that was converted to a tree house by the municipal architect). This park area has been subjected to extensive manipulation and shoreline stabilization after its designation but prior to beginning of the studies reported here. Alterations in this barrier included construction of two rock jetties, recreational and associated parking facilities, and

the construction and periodic maintenance dredging of a relocated Caño Madre Vieja outflow channel. However, as noted in the USFWS CAR, a small stand of mangrove also backs this segment and appears to be near the footprint of the Aguadilla Levee.

5.04 Wetlands. Along the footprint of the Aguadilla Levee is an emergent palustrine freshwater wetland. It is dominated by facultative wetland grasses including *Bracharia purpurascens* with 10% or less depressional wetlands. A similar situation exists along the Espinar Levee, except for a 100-foot by 70-foot area of mangrove swamp found at the Coastal Barrier. This is dominated by 90% red mangroves over 40 feet in height. The meander loop cut between both levees is dominated by 90% mature white mangrove.

The mangrove dominated slough running parallel to the coast behind the sand berms is shown on Photos 11 and 12 of the USFWS CAR. Red mangrove (*Rhizophora mangle)* dominates the channel and is backed by white and black mangroves. This slough is not flushed by all tides, as the mouth of the Caño becomes blocked by a sandbar with some frequency. However, storm tides and extreme Spring tides provide salt water flushing, while draining from the uplands provides fresh water input. Additionally, high storm waves can overwash the protective sand dune and add to the salt content of the mangrove soils. Conversely, during flood periods the water of the slough may be essentially freshwater. The estuarine nature of the area is shown by the presence of some less salt-tolerant species, such as leather fern.

5.05 Prime and Unique Farmland Soils. The principal soil associations found in the study and project area are Coloso-Toa and Bejucos-Jobos soils are found in the lower flood plain; the coastal berms are mapped as Cataño sandy soils Coloso soils were intensively used for sugar cane, and are prime farmland soils. In this area it appears that there are many inclusions of the wetter Bajuras soils. A form AD-1006 (enclosed in the coordination correspondence) has been prepared and will be coordinated with the Natural Resources Conservation Service (NRCS) for the project footprint.

5.06 Cultural Resources. The Río Culebrinas valley is a very important area in the prehistory and history of Puerto Rico. The area was inhabited throughout the Ceramic age of prehistory, demonstrated by archeological sites containing Saladoid and Ostionoid series ceramics. A nine kilometer (5.4 mile) stretch of coastline encompassing the study area is the conjectured 1493 landing site of Columbus. Sir Francis Drake visited the area in 1595. The Iglesia de Espinar, identified as the "ruins of the Hermitage of Inmaculada Concepción of Barrio Espinar, Aguada" on the property's draft National Register form, is one of Puerto Rico's earliest churches and is located adjacent to the Espinar Levee. The church was originally constructed in 1526. Numerous sugar producing haciendas and sugar mills were established in the river floodplain in the 19th and 20th Centuries.

A cultural resources survey was performed on the project area in 1999 (Cinquino et. al. 1999). The investigation identified four archeological sites. Two of the sites, PCI 1 and archeological deposits associated with the Iglesia de Espinar, are eligible for inclusion on the National Register. An additional site, PCI 2, is potentially eligible for the National Register, and Phase II testing is necessary. The fourth site, PCI 3, is not significant.

5.07 Water Quality. Río Culebrinas and Caño Madre Vieja are Class SD - Surface Waters. Class SD waters are intended for use as a raw source of public water supply, propagation and preservation of desirable species as well as primary and secondary contact recreation. Primary contact recreation is precluded in any water containing pathogenic organisms. A review of USGS Water Resources Data (Curtis, R. E., Jr., Z. Aquino, R. J. Vachier, P. L. Diaz, 1991 Water Resources Data Puerto Rico and the U. S. Virgin Islands, USGS-WDR-PR-90-1, 530pp.) revealed that Río Culebrinas water quality parameters measured near Aguada, two kilometers southwest of Aguadilla, are generally within water quality standards for Class SD waters. However, during unusually high flows certain constituents do exceed established standards. For example, iron (86,000ug/l) and zinc (130ug/l) concentrations measured in May 1990 were the highest recorded in Puerto Rico for the 1990-water year. There is no standard for iron but zinc exceeded the standard by 80 ug on this occasion.

5.08 Hazardous, Toxic and Radiological Waste. Review of the Aguadilla, Puerto Rico, U. S. Geological Survey (USGS) map indicates that urbanized or modified areas with potential for Hazardous, Toxic and Radiological Waste (HTRW) contamination are negligible in the study area. The predominant land use is agricultural and poses little or no HTRW threat. There appear to be no landfills, industrial waste treatment plants, light industries, or other facilities likely to generate HTRW. A civil works audit as defined in ER-1165-2-132 for HTRW materials was conducted in May 1995, and updated in May 1999. No signs of potential HTRW problems were identified and no sites with potential for contamination with HTRW were found. Furthermore, no contamination due to hazardous and toxic waste spills is known to be in the study area.

5.09 Air Quality. The general work area is dedicated to agriculture. Therefore, sources of air pollution are minimal and limited mostly to motor vehicles. Air quality is currently within acceptable EPA standards. There are no non-compliance air quality basins or air-sheds included within the proposed work area.

5.10 Aesthetic Resources. Existing visual aesthetic resources found in the Río Culebrinas flood plain are comprised of pasturelands, sugar cane fields, and croplands of the Caño Madre Vieja Channel Basin. A mature stand of shade trees is located along the floodplain on the northwest side of the intersection of Highway 111 and Highway 115. Dense mangroves can be found near the coast on each side of the channel basin, which possess aesthetic value. The mature coconut palms along the golden sandy beach are also an aesthetic element, but they are outside the immediate project area.

5.11 Noise. The area is a rural municipality, where natural noise levels are low, except in the immediate vicinity of highways.

5.12 Socio-Economic Conditions. The 16 "barrios" (wards) of Aguadilla and 18 of Aguada support populations of 63,511 persons and 39,536 persons, respectively. The local economy depends mainly on light manufacturing and local tourism. Other commercial activities of importance are fishing and, to a much lesser degree, small-scale agriculture.

6.00 ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

There would be temporary adverse impacts on air quality, water quality, and aquatic life from clearing, excavating and compacting materials during the construction of levees and channels. No net loss of wetlands is expected.

In the Aguadilla area, residual flooding would cover about 54 acres outside the proposed project right-of-way. Of those, 16 acres are vacant\wetland\parks, and 38 acres are streets\houses\back yards. Urban area residual flooding in most areas would be very shallow nuisance flooding of about 1 foot.

In the Espinar area, residual flooding would cover about 36 acres outside the total project Right-of-way. Of these, 35 acres are vacant wetlands and 1 acre consists of back yards. Back yard flooding is very shallow at less than 1 foot.

6.01 Biological Resources. Total impacts of the project on biological resources are limited to the levee and channel footprints. Neither the timing, volume or duration of flooding on Caño Madre Vieja or Río Culebrinas would be affected by the proposed flood reduction features; therefore, no life stages of migratory stream organisms will be affected. After preliminary discussions with USFWS, the Western (Espinar) levee has been modified to avoid impacting CB segment PR-75, therefore, no mangrove stands will be affected by the levee.

6.02 Coastal Barriers. The proposed work will not result in an increase in the development of the area of Coastal Barrier segment PR-75P. This area has already been developed by the Municipality of Aguadilla.

The Coastal Barrier Resources Act and the Coastal Barriers Improvement Act preclude the use of Federal funds to construct any kind of infrastructure or protection works in a Coastal Barrier area. The intent is to prevent the use of Federal dollars for activities (such as protection from flooding) that may lead or be construed as possibly leading to the development of Coastal Barrier areas. None of the exceptions contemplated in that act apply to this work. For this reason, work within Coastal Barrier segment PR-75 was modified for the recommended plan and the Espinar Levee will end before penetrating Coastal Barrier segment PR-75.

6.03 Wetlands. Project completion will directly impact approximately 1.5 acres of emergent wet prairie currently used as pasturelands. These were assessed to have a total biological value of 1 unit, using the Wetlands Rapid Assessment Procedure Methodology (WRAP). The score was 0.48 for the pasture. Mitigation for unavoidable project impacts, if needed, would include enhancement of 1 acre of emergent wet prairie.

The USACE estimates that project completion will also result in the construction of drainage channels parallel to the levees. These will have an average width of approximately 7 meters (21 feet) and will run for the entire length of the levees. This will create approximately 21 x 9,723 = 204,183 square feet or 4.69 acres of habitat for fish and amphibian species.

The total footprint of the project is 34.98 acres, 16.58 in the Espinar Levee and 16.90 acres in the Aguadilla Levee. Direct biological impacts to 1.5 acres of emergent prairie will accrue. Additionally the remainder of the project will impact 33.48 acres of pasturelands. The 1.5 acres area has a WRAP score value of 0.76, and the remaining footprint has a value of 0.33. The total biological function impacted is equivalent to 12.28 acres of pristine wetland.

The only permanent ponding area along the Aguadilla Levee to be provided by the project would be within the protected side ROW {20 m (wide) x 1,836 m (long)= 9 acres}. The 9 acres ponding is already included in the total ROW.

The only permanent ponding area along the Espinar Levee to be provided by the project would be within the protected side ROW {20 m (wide) x 1,600 m (long)= 8 acres}. The 8 acres ponding is already included in the tota: ROW.

The drainage canals planned for the Espinar and Aguadilla levees will result in the creation of 6.7 acres of wetlands and waters of the United States. Water depths in these will vary from –2 to –4 feet. The USACE estimates that approximately ½ of that acreage will be colonized by wetland plants and will become vegetated shallows useful for wading birds, and other fish, amphibian and invertebrate species. The remaining half of the acreage will also be of value as habitat and spawning ground for various aquatic species expected to colonize the area through its connection to existing water bodies. Additionally, the approximately 60 meter long by approximately 43 meter wide cutoff channel planned for approximately the halfway point between both levees, will result in the creation of an additional 0.9-acre of waters of the United States. The biological functional equivalence loss of 13 units of biological function would be offset by the creation of more than 13.4 units of biological function in wetlands and waters of the United States.

Any dredged spoil will be placed on top of the levees after they are constructed to specification. Excavated material that cannot be used because of any specific physical characteristic, will remain in the borrow pit site or be disposed of in the adjoining municipalities authorized solid waste landfills, operating at the time of project construction.

If any of the vacant lands within the residual flooding area are to be developed with or without the project, then Puerto Rico Planning Board Regulation 13 will require the developer provide an H&H analysis and to provide the area with some kind of flood improvements to eliminate existing river flooding or with project residual flooding (which is less than river flooding). The recommended course of action in this case is not to develop in any of the residual flood areas.

6.04 Prime and Unique Farmland Soils. The Recommended Plan would eliminate by direct impact approximately 4.75 hectares (11.7 acres) of farmland, of which approximately 2.2 hectares (5.43 acres) are in pasture production and approximately 0.6 hectares (1.5 acres) of wet pasturelands. The Recommended Plan would disconnect approximately 980 meters of live stream from the Caño Madre Vieja.

The remainder of the footprint of both levees (33.1 acres, or 13.4 hectares) traverses land that for more than 100 years has been dedicated to sugarcane cultivation and is currently used as pastureland. It is currently colonized by upland grasses. The Río Culebrinas and Caño Madre Vieja themselves are at a lower elevation than the surrounding lands. Additionally, extensive development exists adjacent to both confines of the work area. Therefore, development acts as a containment berm for any water flow from the north or south into the area bound by Río Culebrinas and Caño Madre Vieja. The rivers influence on the surrounding area would be limited to its immediate adjacency and any area inundated during flooding events. This would not ensure a continuous hydroperiod that would facilitate re-colonization by wetland species. If agricultural activity were to cease in the area bound by the Río Culebrinas and Caño Madre Vieja, it would not be expected to revert to wetlands.

The area is predominantly rural, with both small-scale commercial and subsistence agriculture existing on site. Coordination with the Natural Resources Conservation Service (NRCS) was initiated on September 29, 1999, and concluded on November 1, 1999. Although the NRCS identified approximately 13.0 acres of prime and unique farmland and 7.0 acres of statewide and local important farmland. However, on January 10, 2000, when the NRCS reply was received, Ms. Carmen Santiago of the NRCS stated that for scores over 160 (combined sections V and VI), at least 2 other alternatives should be rated and scored, unless there were overriding reasons to have only 1 alternative. In this case, with a borderline score of 162, she stated that our explanation in the Environmental Assessment (EA) and the "Reason for selection" part of Form AD-1006 was sufficient.

6.05 Cultural Resources. Archeological deposits associated with the Iglesia de Espinar and deposits at PCI Site1 will be adversely affected. Archeological data recovery will be undertaken to mitigate adverse effects. The Iglesia de Espinar ruins will be protected by the project from future flooding. A Phase II archeological assessment will be conducted at PCI 2.

6.06 Water Quality. Based on this preliminary analysis the Recommended Plan should not result in violations of water quality standards. Water quality will not be adversely impacted by this project, and Commonwealth water quality standards will be met. Contaminants will not be introduced by clean fill material that may become suspended or dissolved in the river water during the construction operations. Short-term increases in the turbidity are expected during the construction phase of the project; however, the system will re-establish itself as a productive part of the overall ecosystem. No long-term surface water quality problems will result.

6.07 Hazardous, Toxic or Radiological Waste (HTRW). No sources of HTRW have been identified in the area either with or without the project. Therefore, the proposed work will have no effect in the amount of HTRW in the work area.

6.08 Air Quality. With the project, the area will remain as a predominantly agricultural area. Therefore, the project will not result in any changes in air quality. Exhaust emissions from construction machinery will be negligible. Therefore, no adverse effects on air quality will result from the implementation of the proposed project. Fugitive dust may be generated by the excavation and deposition of fill material, as in the construction of levees. All dust and pollution suppression measures and equipment required under Federal and Commonwealth laws and regulations will be utilized during project construction.

6.09 Aesthetic Resources. The contention structures themselves will be harmoniously incorporated into the aesthetic appearance of the area. The quality of the aesthetically pleasing green areas where the work will take place will not be compromised by discordant project results.

6.10 Noise. At project completion, the area will remain rural and exhibit minimum noise. The proposed work will have no effect on current noise levels. Any noise due to construction will be temporary.

6.11 Effects on Community Cohesion and Socio-Economic Well-Being. The proposed work will result in enhanced community cohesion and socio-economic well being. This will be brought about by the enhanced opportunities for development and creation of employment sources both by the work itself and by the enhanced investment climate when the risk of property loss is abated. This will benefit community cohesion, when community members are no longer forced to migrate to other areas in search of employment.

6.12 Unavoidable Impacts and Irretrievable Commitments of Resources. None expected. Project impacts on biological values of existing wetland habitat will be mitigated for.

6.13 Cumulative and Secondary Effects. The project will result in the protection of the delimited area from further flooding damage. This will not result in a stimulus to the subsequent development of the area, as the local government will commit to non-development of the area adjacent to the protected sides of the levees.

6.14 Relationship Between Short Term Use of the Environment and Long Term Productivity. The project does not propose use of the environment as such. However, the use of a tract of land to provide the levee and channel footprints, if construed as "use," will be offset by the productivity benefits that will come to the area protected from flooding. These benefits will accrue both to the socio-economic component (whose life and property will be secured) and the biologic environmental component (since both existing wetland values, and the habitat values of agricultural and other rural areas will be protected from destruction through flooding).

7.00 COMMITMENTS

A Phase II archaeological investigation of any impacted sites will be performed during the plans and specifications phase prior to construction. A mitigation plan for cultural resources that might be impacted will be developed in coordination with the SHPO. Mitigation will be completed prior to project construction.

Pertinent USFWS recommendations for this project would be incorporated before completion of the final report. A concurrence with the USACE determination of consistency with the Puerto Rico Coastal Management Program will be sought from the Puerto Rico Planning Board (PRPB) when coordination of the recommended plan through this EA is complete and public comments have been received. This is in accordance with PRPB policy.

The government of Puerto Rico must commit to the non-development of the area comprised between the currently developed protected side of the levees and the levees themselves.

The recommended plan has been modified by deleting all proposed work within CB segment PR-75. This was in order to comply with the stipulations of the Coastal Barriers Resources Act and the Coastal Barriers Improvement Act of 1990. These Acts prohibit the expenditure of Federal funds to enhance the infrastructure of a designated Coastal Barrier area in such a way to stimulate development of a Coastal Barrier.

8.00 COMPLIANCE WITH LAWS EXECUTIVE ORDERS AND REGULATIONS

8.01 National Environmental Policy Act of 1969, as amended. Environmental information on the project has been compiled and this draft. Will be circulated prior to finalization in accordance with the National Environmental Policy Act.

8.02 Endangered Species Act of 1973, as amended. In the scoping process for this project, the USACE made a determination of no impact on any federally listed endangered or threatened species. The National Marine Fisheries Service concurred by letter dated August 8, 1995. A new Coordination Act Report (CAR) was received by the USACE on November 30, 1999. This document did not identify any endangered or threatened species in the work area, nor identified any impacts to the critical habitat of any endangered or threatened species.

8.03 Fish and Wildlife Coordination Act of 1958, as amended. In response to the requirements of this Act, the USACE has and will continue to maintain continuous coordination with the USFWS during all stages of the planning and construction process. Biologists from USFWS and DNER will continuously review the process. A CAR was received by the USACE on November 30, 1999. The USFWS recommended installing a

larger diameter two-way culvert to maintain hydrology to the mangrove channel parallel to the coastal barrier; that the wetlands in the protected side of the dikes be protected possibly by sitting the planned drainage culverts at an elevation such that the wetlands themselves are not drained into the flooding side of the dikes. The USFWS recommended mitigation through the development of additional estuarine and freshwater wetlands with the floods levees. The USACE decided to incorporate to the project design the recommendations of the USFWS regarding keeping the levee out of the Coastal Barrier segment PR-75, and coordinate this decision with the USFWS.

8.04 National Historic Preservation Act of 1966, as amended. Cultural resource Investigations and consultation with the Puerto Rico State Historic Preservation Officer (SHPO) are in compliance with the National Historic Preservation Act of 1966, as amended (P.L. 89-665), the Archeological and Historic Preservation Act (P.L. 93-291), and 36 CFR Part 800.

8.05 Clean Water Act of 1972, as amended. The study is in partial compliance. A Section 404(b) Evaluation has been completed and is presented in Attachment C. Full compliance will be achieved with issuance of a water quality certificate (WQC) from the Environmental Quality Board of Puerto Rico. WQC issuance is expected, but Commonwealth procedures require application to begin after NEPA coordination is completed, not before.

8.06 Clean Air Act of 1972, as amended. No significant emissions as defined in air quality regulations will be generated on the project, and no air quality permits will be required. Full compliance will be achieved with receipt of comments on the EA from the U.S. Environmental Protection Agency.

8.07 Coastal Barriers Improvement Act of 1990. The coastal berm originally proposed for tie-in of the Espinar Levee is designated Coastal Barrier (CB) segment PR-75. The part of the levee that impact a small portion of CB segment PR-75 was originally considered as essential to the successful attainment of the human protection goals of this project, at the 100-year flood level. However, the Coastal Barrier Resources Act and the Coastal Barrier Improvement Act preclude the use of Federal funds to construct any kind of infrastructure or protection works in a CB area. The intent is to prevent the use of federal Dollars for activities that may lead to the development of Coastal Barrier Areas (such as protection from flooding). None of the exceptions contemplated in that act apply to this work. Therefore, all work within CB segment PR-75 has been deleted from the project.

8.08 Coastal Zone Management Act of 1972, as amended. At this time the study and recommended plan have been determined to be in compliance with the major programs and objectives of the Puerto Rico Coastal Management Program. Concurrence from the Puerto Rico Planning Board (PRPB) will be sought when the public comment period on this EA has closed.

8.09 Farmland Protection Policy Act of 1981. Coordination with the NRCS was concluded on January 10, 2000. No further coordination is required.

8.10 Resource Conservation and Recovery Act of 1976, as amended, and Toxic Substances Control Act of 1976, as amended. No items regulated under these laws or other laws related to hazardous, toxic or radiological waste substances have been discovered. None are considered likely to exist in the study and project area.

8.11 Executive Order 11990, Protection of Wetlands. This Order requires that Federal Agencies avoid impacts to wetlands unless there are no practicable alternatives. It further requires that Federal Agencies minimize losses to the beneficial values of wetlands and preserve and enhance the beneficial values of wetlands. The recommended plan is in compliance with this Executive Order.

8.12 Executive Order 11988, Floodplain Management. The work is in compliance with this order. The project is located in a floodplain area where there are currently residences and permanently occupied structures. The project will result in protection of the inhabited areas adjacent to the floodplain area from further flooding.

8.13 Executive Order 12898, Environmental Justice. This Order prohibits disproportionately adverse Federal project effects on minority and low-income populations. The principal beneficiaries of the recommended improvements are the farmers, industrial, commercial agricultural workers, and associated persons who currently occupy the floodplain area. This is considered to be a low-income demographic group. The injection of 4 million dollars in Federal funds and matching sponsor funds into the local economy will significantly stimulate the local economy.

9.00 COORDINATION AND PUBLIC COMMENT

Environmental scoping was begun on February 26, 1991, during the Reconnaissance level studies. Additional scoping with Commonwealth and Federal agencies took place via letter dated July 14, 1995. Responses were received from the Office of the Governor of Puerto Rico, Puerto Rico Department of Agriculture, Puerto Rico Department of Natural and Environmental Resources, Puerto Rico Land Administration, Puerto Rico Planning Board, Administración De Servicios Municipales, Municipio de Aguadilla, Colegio De Ingenieros y Agrimensores De Puerto Rico, Puerto Rico Industrial Development Company, Oficina Estatal De Preservación Histórica (State Historic Preservation Office SHPO), and U.S. Fish and Wildlife Service. No adverse comments were noted in the responses received. After new regulations pursuant to the Magnuson-Stevens Fishery Resources July 6 and 7, 1999, prompted NMFS comments regarding no effects to EFH.

This Report and EA will be coordinated with all major Commonwealth agencies and to concerned Federal agencies in Puerto Rico and on the mainland for public review during at least a 45-day period, to comply with requirements of the National Environmental Protection Act and the Puerto Rico Coastal Management Program.

10.0 LIST OF EA PREPARERS

Esteban Jiménez, Biologist, Barbara B. Cintrón, Biologist, David McCullough, Archeologist, Jorge M. Tous, Civil Engineer.

11.0 REFERENCES

Cinquino, Michael A., Robert J. Hanley, Michele H. Hayward, Frank J. Schieppati, Hugh Tosteson. Cultural Resource Survey of the Rio Culebrinas Flood Protection Project, Municipio of Aguadilla, Puerto Rico. Panamerican Consultants, Inc., Buffalo Branch Office, 36 Brunswick Road, Depew, New York 14043. July 1999.

Section 205, Reconnaissance Report, Río Culebrinas at Aguadilla, Puerto Rico, U.S. Army Corps of Engineers, Jacksonville District, March 1992.

12.0 PROPOSED FINDING OF NO SIGNIFICANT IMPACT (FONSI).

I have reviewed the Detailed Project Report (DPR) and Environmental Assessment (EA) prepared for Río Culebrinas at Aguadilla and Aguada, Puerto Rico. The recommended plan in the DPR is the proposed action. I conclude that the proposed action will have no significant impact on the quality of the human environment. This conclusion is based on information analyzed in the DPR and EA. It also reflects pertinent information obtained from other agencies and special interest groups having jurisdiction by law and/or special expertise, and on comments and recommendations obtained after coordination of the DPR. Reasons for this conclusion are, in summary,

1. There will be no adverse impacts to endangered species of flora or fauna, wetlands or significant fish and wildlife populations or habitats. Recommendations of the US Fish and Wildlife Service regarding the Coastal Barrier segment PR-75, have been adopted.

2. Water quality will not be adversely affected. Puerto Rico water quality standards will be met and a Water Quality Certificate (WQC) will be obtained from the Puerto Rico Environmental Quality Board.

3. Archeological deposits associated with the Iglesia de Espinar and deposits at PCI Site 1 will be adversely affected. Archeological data recovery will be undertaken to mitigate adverse effects. The Iglesia de Espinar ruins will be protected by the project from future flooding. A Phase II archeological assessment will be conducted on archeological deposits at site PCI 2.

4. The USACE has determined that the project is consistent with the Puerto Rico Coastal Management Program. A Determination of Consistency is included in this EA. Puerto Rico Planning Board concurrence with the determination is expected, because no significant coastal resources will be affected, and no Puerto Rico or Federal agency has objected.

5. A level-1 survey and assessment for the presence of Hazardous, Toxic or Radiological Waste materials (HTRW), updated in 1998, indicated no known or suspected materials in the project footprint.

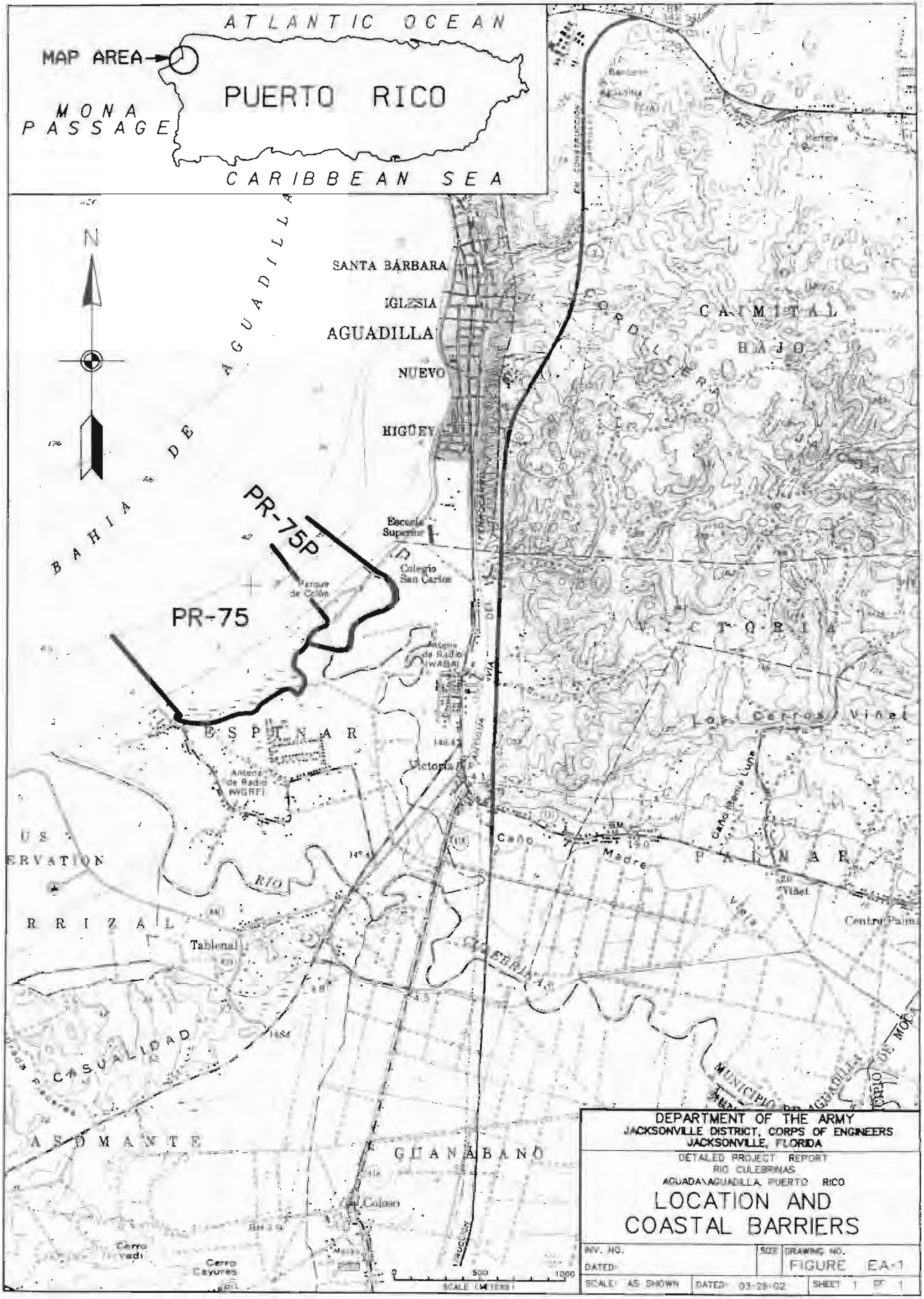
6. Public benefits include reduction flooding and damage to buildings and furnishings, improvement of public health and safety and elimination of other losses caused by flooding in this watershed, up to a return frequency of 1%. Adverse effects are temporary, will occur during construction, and include incidental noise and vehicular exhaust fumes. Construction activities will be planned, scheduled and sequenced to minimize adverse effects.

In consideration of the information summarized, I find that the proposed action will not significantly affect the human environment and do not require an Environmental Impact Statement.

Date

JAMES G. MAY
Colonel, Corps of Engineers
Commanding

13.0 FIGURES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AGUADILLA
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Colegio San Carlos
Parque de Colón
Antena de Radio (WABA)
Antena de Radio (WGRF)
ESPINAR
Victoria
CAIMITAL BAJO
VICTORIA
Los Cerros
Caño Madre Vieja
PALMAR
Centro Palmar
Tablonal
CASUALIDAD
ASOMANTE
GUANÁBANO
Cerro Cayures
MUNICIPIO DE AGUADILLA
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO
LOCATION AND
COASTAL BARRIERS
INV. NO.
DATED:
SIZE
DRAWING NO.
FIGURE EA-1
SCALE: AS SHOWN
DATED: 03-29-02
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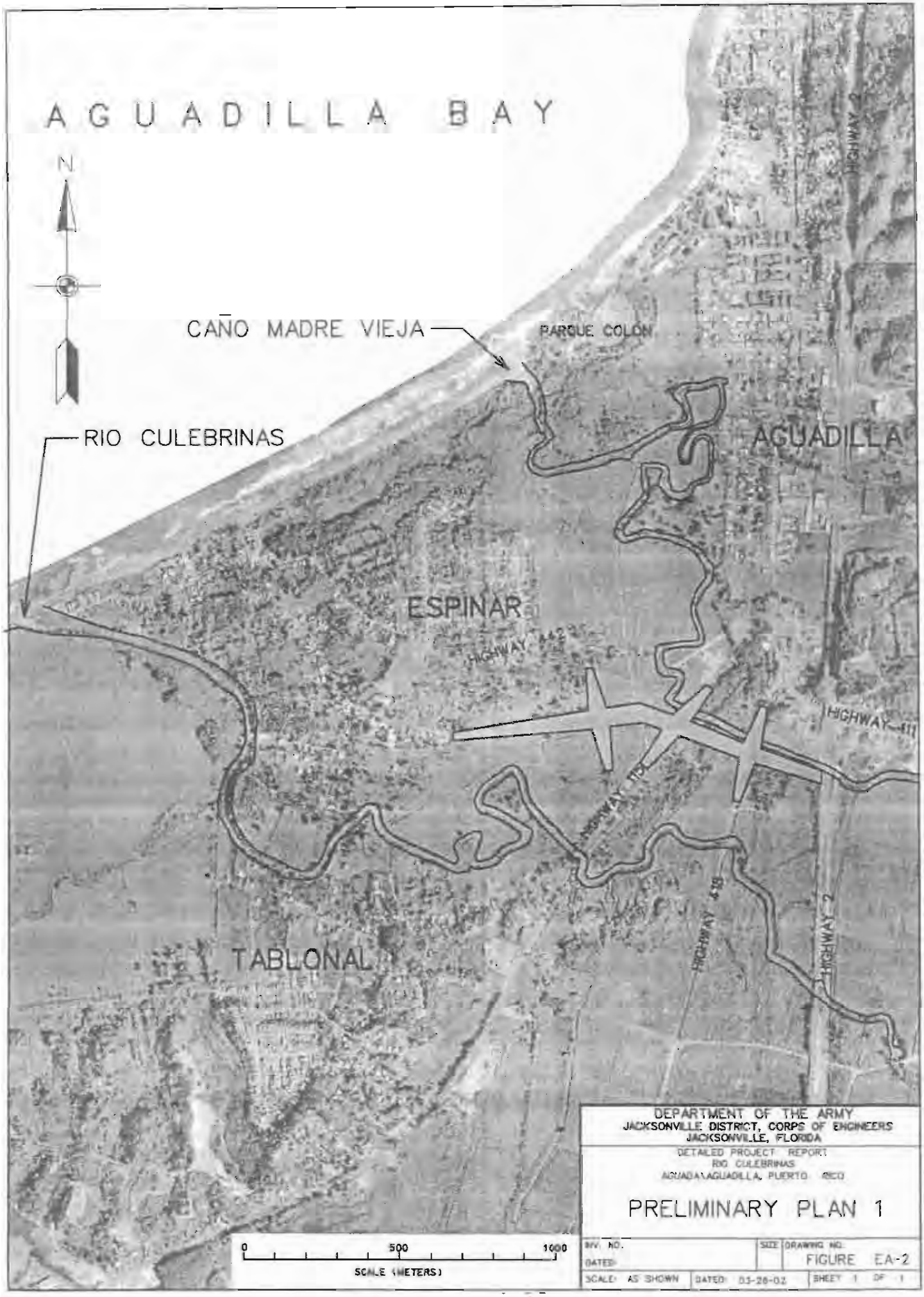
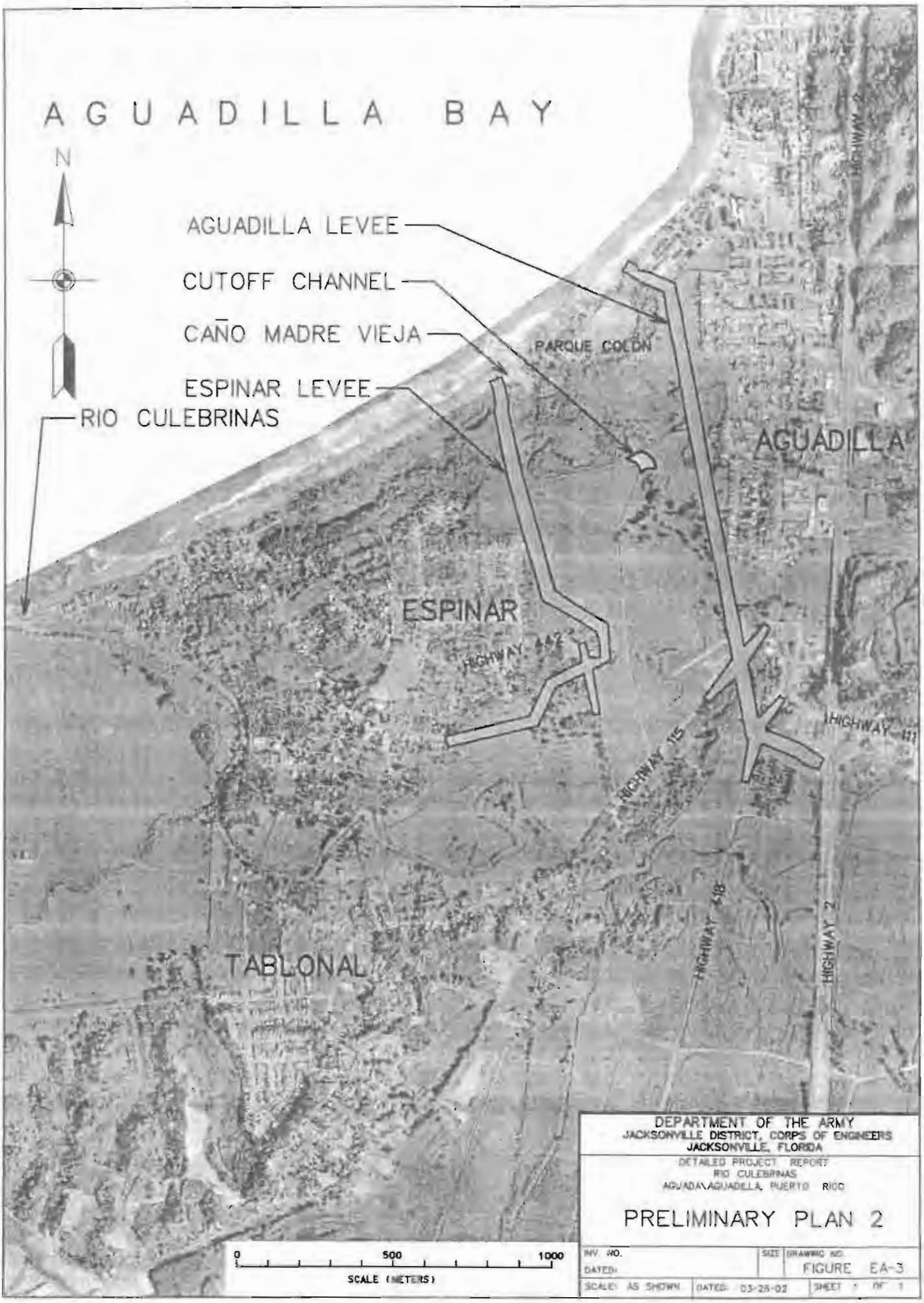


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

PRELIMINARY PLAN 1

INV. NO.		SIZE	DRAWING NO.
DATED:			FIGURE EA-2
SCALE: AS SHOWN	DATED: 03-26-02		SHEET 1 OF 1

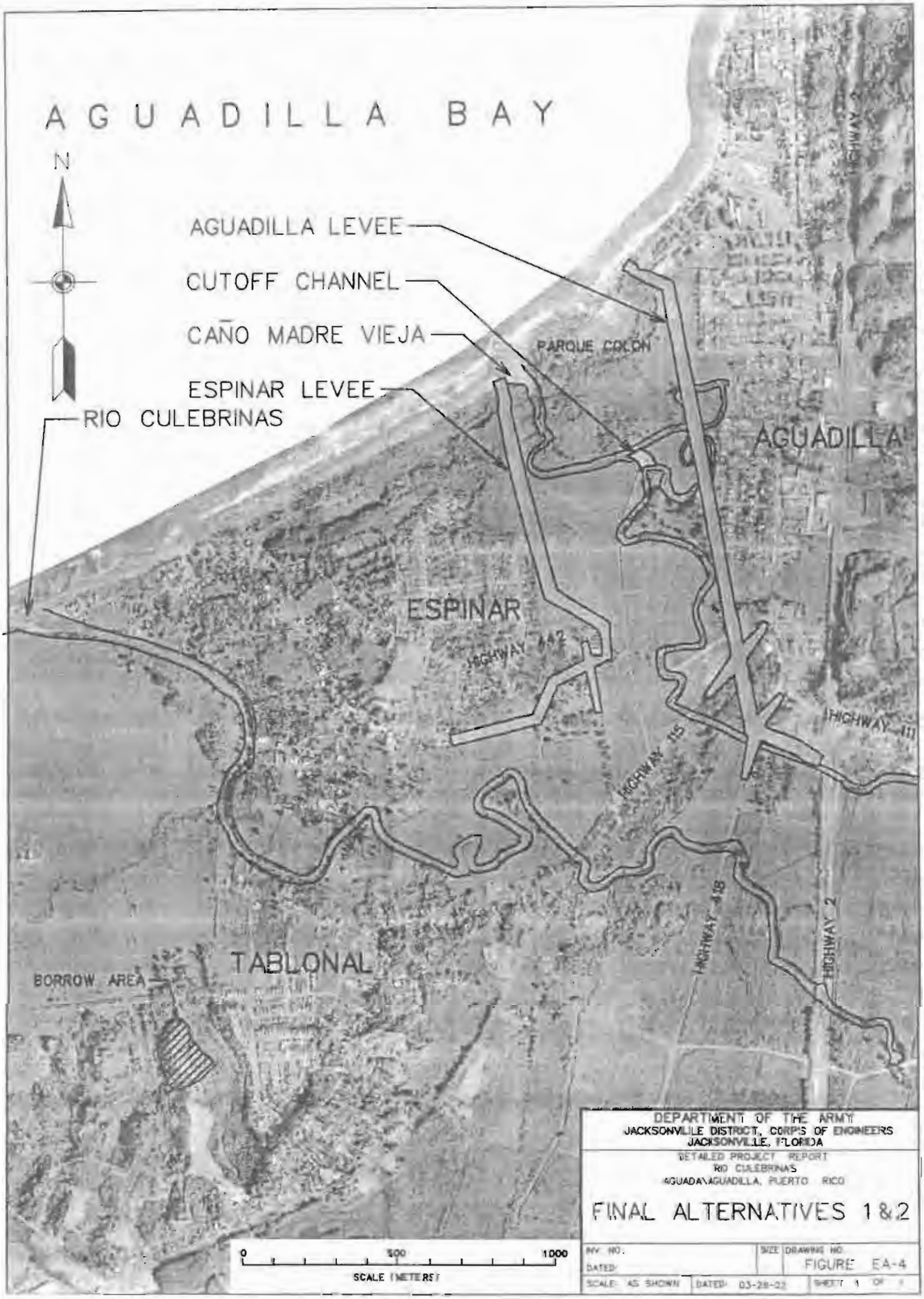


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

PRELIMINARY PLAN 2

INV. NO. DATED:		SIZE	DRAWING NO. FIGURE EA-3
SCALE: AS SHOWN	DATED: 03-26-02		SHEET 1 OF 1

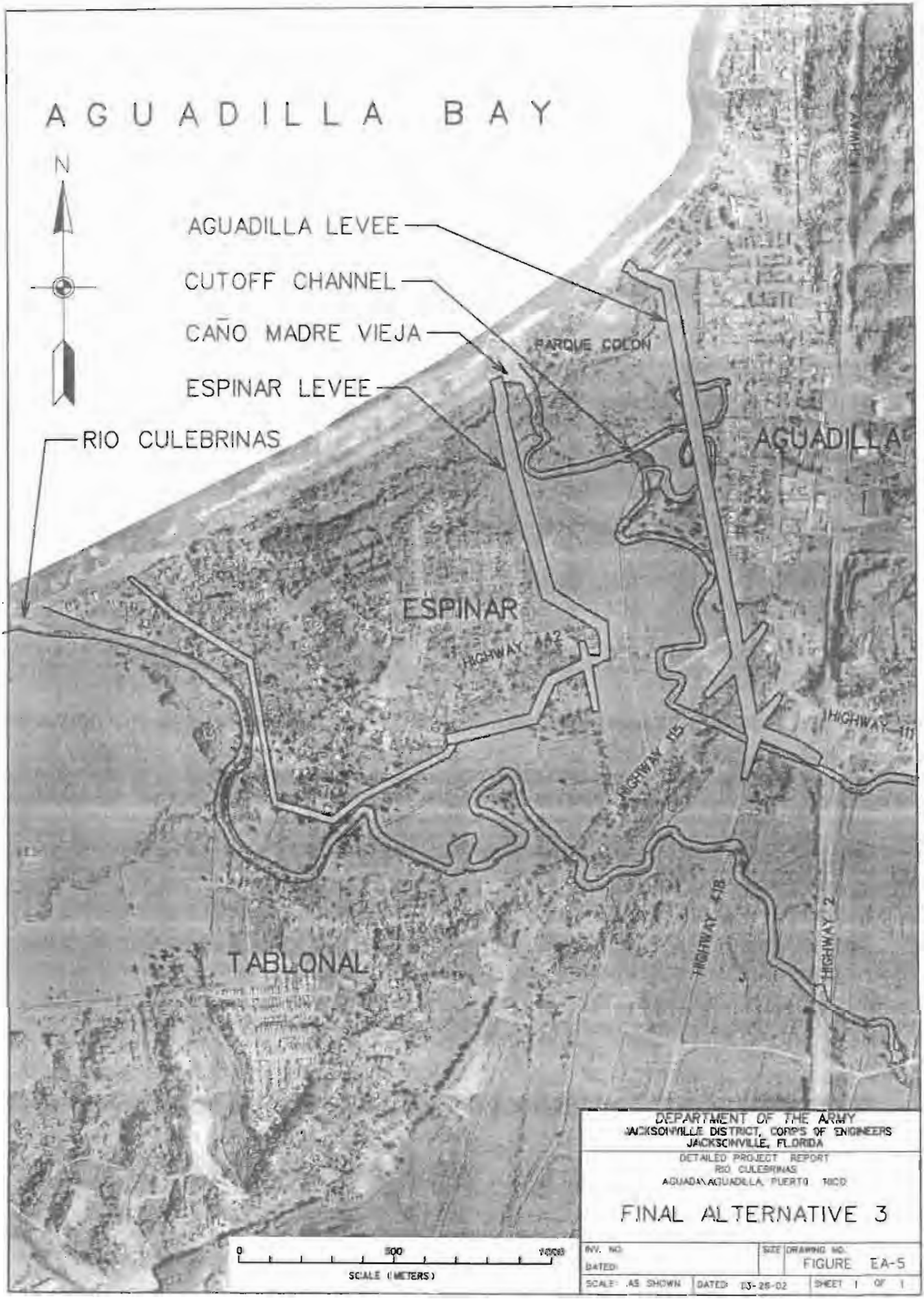


DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

FINAL ALTERNATIVES 1&2

INV. NO.		SIZE	DRAWING NO. FIGURE EA-4
DATED:			
SCALE: AS SHOWN	DATED: 03-28-02		SHEET 1 OF 1

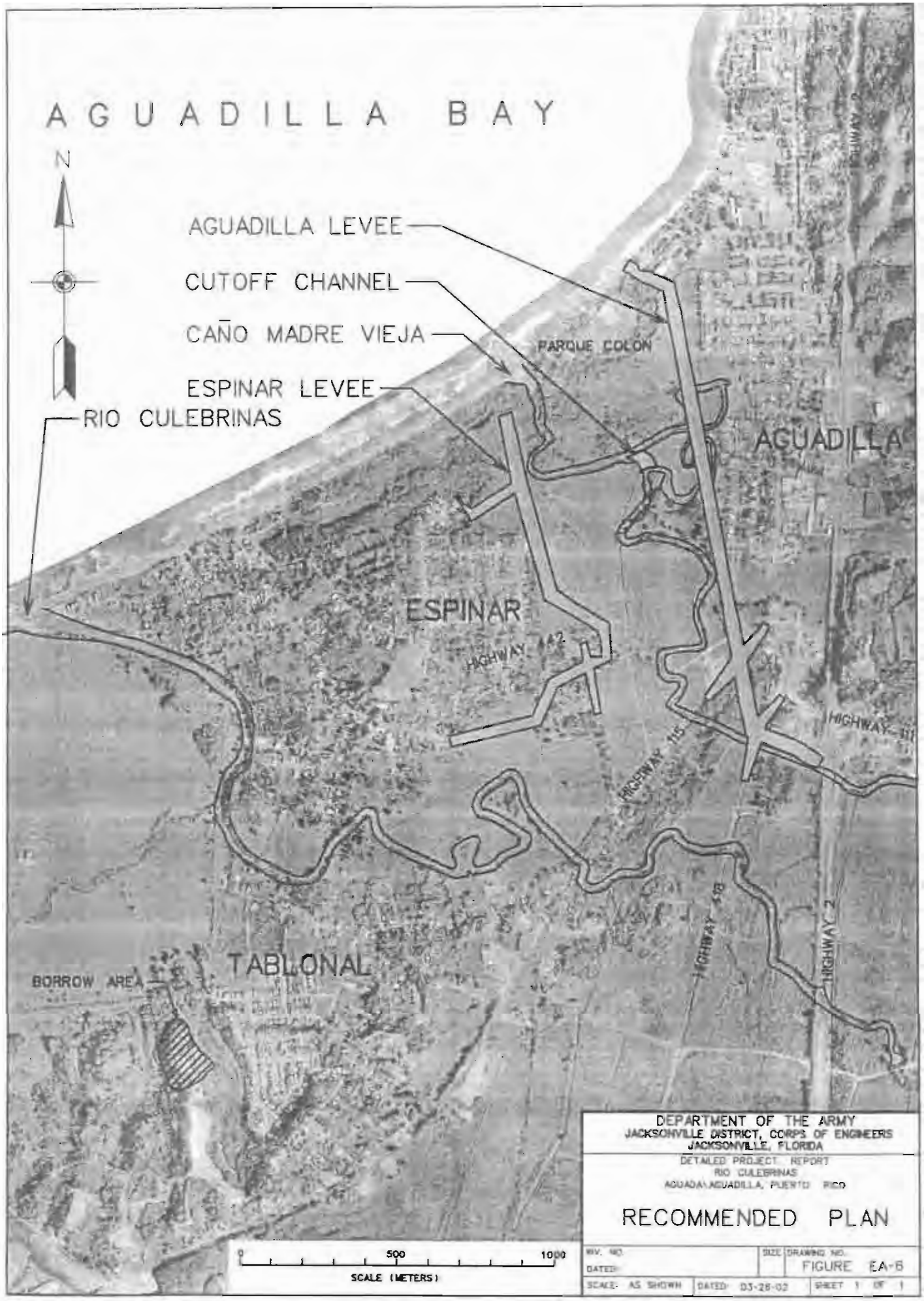


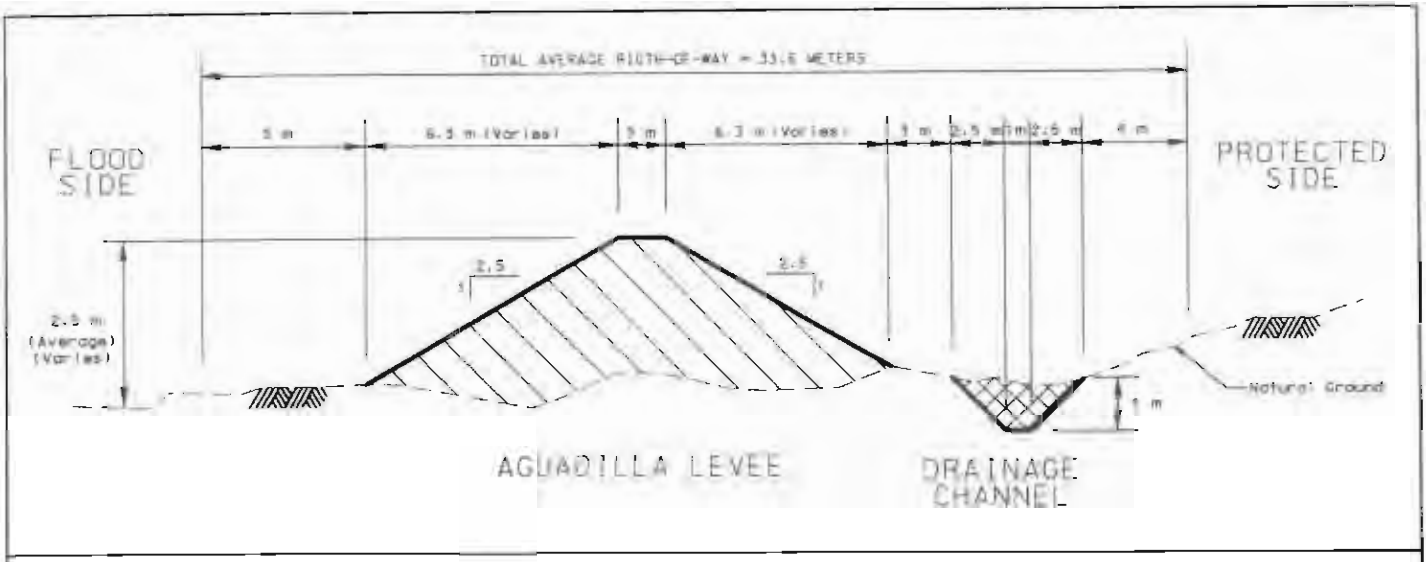
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

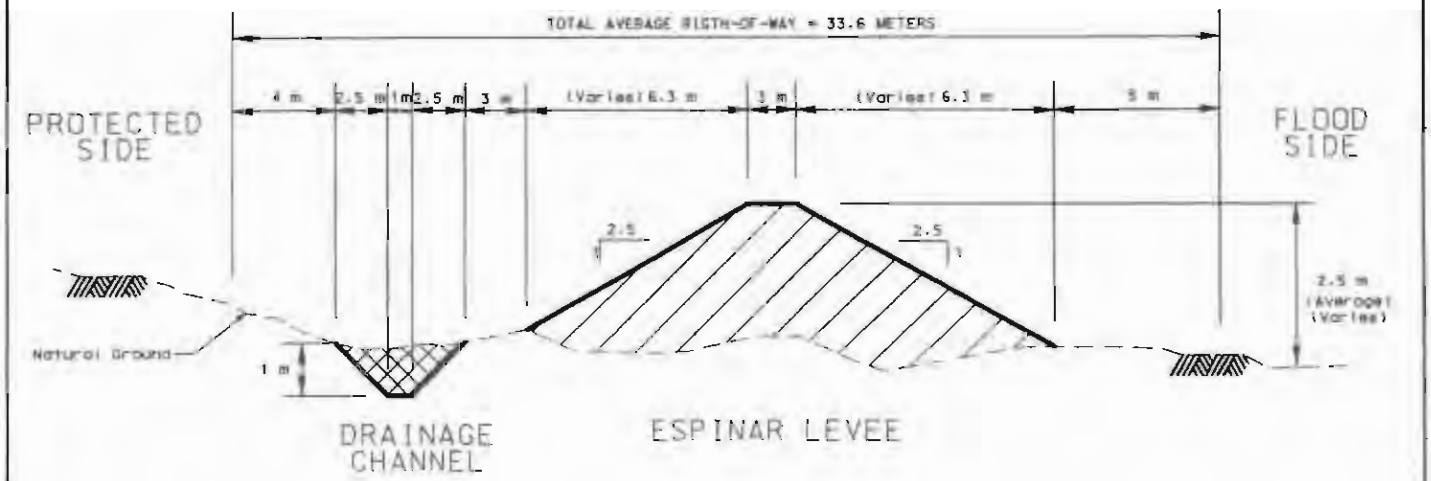
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

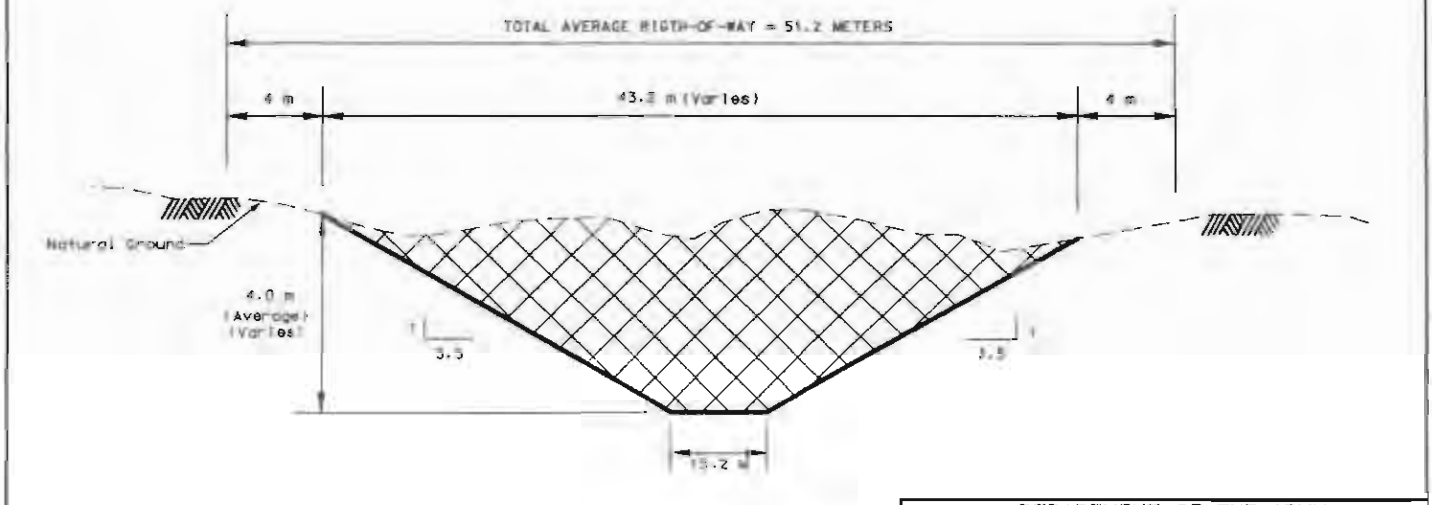
FINAL ALTERNATIVE 3

INV. NO.	SIZE	DRAWING NO.
DATED:		FIGURE EA-5
SCALE: AS SHOWN	DATED: 03-26-02	SHEET 1 OF 1


AGUADILLA BAY
N
AGUADILLA LEVEE
CUTOFF CHANNEL
CAÑO MADRE VIEJA
ESPINAR LEVEE
RIO CULEBRINAS
PARQUE COLON
AGUADILLA
ESPINAR
HIGHWAY 442
HIGHWAY 111
HIGHWAY 115
HIGHWAY 418
HIGHWAY 2
TABLONAL
BORROW AREA
0
500
1000
SCALE (METERS)
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO
RECOMMENDED PLAN
REV. NO.
DATED:
SIZE
DRAWING NO.
FIGURE EA-6
SCALE: AS SHOWN
DATED: 03-28-02
SHEET 1 OF 1







DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

TYPICAL CROSS SECTIONS

REV. NO.	SIZE	DRAWING NO.
DATED:		FIGURE EA-7
SCALE: NTS	DATED: 03-26-02	SHEET 1 OF 1

14.0 EA ATTACHMENTS

A. PUBLIC AND AGENCY COORDINATION AND COMMENTS

B. FISH AND WILDLIFE COORDINATION ACT REPORT

C. CLEAN WATER ACT SECTION 404 (b)(1) EVALUATION AND MITIGATION PLAN

D. COASTAL ZONE MANAGEMENT ACT COORDINATION – Certification of Compliance with PR Coastal Management Plan and Application for Concurrence from PR Planning Board.

E. SITE VISIT MEMORANDUM AND WRAP SCORE SHEETS

A. PUBLIC AND AGENCY COORDINATION AND COMMENTS

Environmental scoping was initiated on February 26, 1991. Further scoping took place via letter dated July 14, 1995 (copy of scoping document is enclosed). Responses on the study were received from the Office of the Governor of Puerto Rico, Puerto Rico Department of Agriculture, Puerto Rico Department of Natural Resources, Puerto Rico Land Administration, Puerto Rico Planning Board, Administración De Servicios Municipales, Municipio de Aguadilla, Colegio De Ingenieros Y Agrimensores De Puerto Rico, Puerto Rico Industrial Development Company, Oficina Estatal De Preservación Histórica (SHPO), and United States Department of Interior Fish and Wildlife Service. No adverse comments were noted in the responses received.

CESAJ-PD-ES 10 January 2000

MEMORANDUM FOR RECORD

SUBJECT: Río Culebrinas Flood Control Project, USDA NRCS AD-1006

1. Today at 0915, I teleconferenced with Ms. Carmen Santiago (USDA-NRCS 787-766-5206 x240), regarding the NRCS letter of 1 November 1999, received today and addressing our 23 September 1999, Form AD-1006 regarding this project.

2. Ms. Santiago stated that for scores over 160 (combined sections V and VI), at least 2 other alternatives should be rated and scored, unless there were overriding reasons to have only 1 alternative. In this case, with a borderline score of 162, she stated that our explanation in the Environmental Assessment (EA) and the "Reason for selection" part of Form AD-1006 was sufficient.

3. Since she also stated that usually she never received anything back after returning these forms, I entered her address in our Federal officials roster for Puerto Rico, in order to send her a completed EA for her record.
////////////////////////////////////nothing follows//

ESTEBAN JIMENEZ
Biologist

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

July 9, 1999

Planning Division
Environmental Resources Branch

TO THE ADDRESSEES ON THE ATTACHED LIST

The Jacksonville District, U.S. Army Corps of Engineers (USACE), wishes to re-coordinate for any resources agency issues and concerns in reference to the flood protection plans along the Río Culebrinas and Caño Madre Vieja, south of Aguadilla, Puerto Rico. This work was originally coordinated by letter dated April 26, 1991. The USACE continues to gather information to help define issues and concerns that were identified and addressed in the enclosed reconnaissance-level report for flood protection along the Río Culebrinas and Caño Madre Vieja, south of Aguadilla, Puerto Rico. Various preliminary alternative plans to provide protection against flooding were evaluated.

The study is currently in its feasibility phase. During the reconnaissance study environmental considerations such as potential presence of historical or archeological resources, aesthetics, recreation demand, endangered or threatened species and nearshore marine habitats were addressed. The reconnaissance phase of the study showed the project to implementable. At this time, the Municipality of Aguadilla has agreed to fund one-half of the study costs. Therefore, the feasibility phase of the study has been undertaken.

We welcome your views, comments and information about resources, study objectives and important features within the describe study area, as well as any suggested improvements. Letters of comments or inquiry should be addressed to the letterhead address to the attention of Planning Division, Environmental Studies Section and received by this office by July 31, 1999.

Sincerely,

James C. Duck
Chief, Planning Division

Enclosures

MAILING LIST
AGUADA AND AGUADILLA, PUERTO RICO, SECTION 205 STUDIES

Hon. Pedro Rosselló
Governor of Puerto Rico
La Fortaleza
San Juan, PR 00901
Attn: Fed Affairs Coordinator

Hon. Ramón Calero Bermúdez
Mayor, Municipio of
Aguadilla
Box 1008
Aguadilla, PR 00605

Hon. Julio César Román
Mayor, Municipio of
Aguada
Box 517
Aguada, PR 00602

Mr. Pedro Gelabert
Secretary, Dept of Natural
& Environmental Resources
Box 5887
Pta de Tierra PR 00906

Ms Lisbeth Hyman,
Acting Asst. Director
Minerals and Water Resources
Administration, DNER
Box 5887 Pta. de Tierra
PR 00906

Lic. Héctor A Russe
President, Puerto Rico
Environmental Quality Board
PO Box 11488
Santurce, PR 00919

Ms. Norma E. Burgos
Chair, P.R. Planning Board
PO Box 41119 Minillas Sta
San Juan PR 00940-9985

Dr. Emilio M. Colón
Executive Director, PR
Aqueduct & Sewer Auth.
PO Box 7066 Bo Obrero Sta
Santurce PR 00916

Secretary of Agriculture
PO Box 10163
Santurce PR 00908

President,
Senado de Puerto Rico
Box 3431
San Juan PR 00904

President,
House of Representatives
of Puerto Rico
Box 2228
San Juan PR 00901

Exec Director,
PR Lands Administration
GPO Box 36-3767
San Juan PR 00936

Dr. Sergio L. González Quevedo
Exec Dir PR Highways Auth
GPO Box 42007
San Juan PR 00936

Director,
PR Office of Budget and
Management
Box 3228
San Juan PR 00902

Director, Civil Defense
Box 5127
Puerta de Tierra PR 00906

Mr. Pedro Toledo Dávila
Superintendant, PR Police
GPO Box 70166
San Juan PR 00936

Mr. Agustín García Acevedo
Pres, PR Telephone Co.
GPO Box 998
San Juan PR 00936

President,
PR Industrial Development Co.
GPO Box 2350
San Juan PR 00936

Secretary, Dept of Transportation
and Public Works
PO Box 41269 Minillas Sta
Santurce, PR 00940

Secretary, Dept of Recreation
and Sports
Box 3207
San Juan PR 00902

Exec. Director,
PR Land Authority
PO Box 9745
Santurce PR 00908

Administrator
Puerto Rico Economic Development
Administration
PO Box 36-2350
San Juan PR 00936

Secretary,
Puerto Rico Dept of Housing
PO Box W
Río Piedras PR 00928

Exec Director, Public Bldgs
Authority
Box 41029
Santurce PR 00940

Dr. Arleen Pabón de Rocafort
State Historic Preservation
Officer
Office of the Governor
La Fortaleza Box 82
San Juan PR 00901

Director,
Center for Investigations
Institute of Puerto Rico
Culture
Box 4184
San Juan, PR 00905

Executive Director,
Rural Housing Administration
Po Box 21365
Río Piedras PR 00928

Exec Director
PR Electric Power Authority
GPO Box 4267
San Juan PR 00936-4267

Mr. Juan Martínez
Director Soil Conservation
Service, San Juan Office
GPO Box 4868
San Juan PR 00936

Mr. James P. Oland
Field Supervisor, FWS
Caribbean Field Office
PO Box 491
Boquerón PR 00622

Eng. Carl-Axel P Soderberg
Director, Carib Field Office
U.S. EPA
Europa Bldg Suite 417
1492 P de Leon Stop 22
Santurce PR 00909

Director,
Dept of Housing and Urban Dev.
159 Ave Chardón
New San Juan Bldg
Hato Rey, PR 00918-1804

District Chief,
Caribbean Dist., USGS WRD
GSA Center 651 Federal Drive
Suite 400-15
Guaynabo PR 00965

Natl Marine Fisheries Serv
Habitat Conservation Div. F-SER1
9721 Executive Center Drive
St. Petersburg, FL 33702

National Marine Fisheries Serv
3500 Delwood Beach Rd
Panama City FL 32407-7499

Natl Marine Fisheries Service
Miami Field Office
11420 N. Kendall Dr Ste 103
Miami Fl 33176

Regional Director, SE Region
U.S. Fish and Wildlife Service
1875 Century Blvd., Suite 200
Atlanta Ga 30345-3301

Environmental Impacts Branch
US EPA Region II
290 Broadway, 28th Floor
New York, NY 10007-1866

Executive Director
Advisory Council on
Historic Preservation
Old Post Office Bldg 809
1100 Pennsylvania Ave NW
Washington DC 20004-2590

Office of the Director
Ctr for Environmental Health
and Disease Control/F29
Center Clifton Rd
Atlanta GA 30333

Puerto Rico Conservation Trust
PO Box 4747
San Juan PR 00918

Puerto Rico Cons. Foundation
O'Neill #11 Altos
Hato Rey PR 00918

President, PR
Engineers & Surveyors' Assn
GPO Box 3845
San Juan PR 00936

PR Environmental Coalition
Cond Altos de Torrimar
90 Caribe Apt 146
Bayamon PR 00959

Dr. Gregory Morris & Assoc.
PO Box 5635
San Juan PR 00902-5635

Natural Resources Defense
Council
1350 New York Ave NW
Washington, DC 20005

USDA United States Department of Agriculture
Natural Resources Conservation Service
Caribbean Area
PO Box 364868
San Juan, PR
00936-4868

November 1, 1999

James C. Duck
Chief, Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Duck:

Re: Río Culebrinas flood control project, Aguadilla/Aguada, Puerto Rico.

Based on the location map for the project, the predominant soils are: (Ce) Cataño sandy clay loam, (Ba) Bajura clay, (Es) Espinal sand, (Cn) Coloso silty clay loam, (Ig) Igualdad clay and (ToA) Toa silty clay loam, 0 to 2 percent slopes.

The map units ToA and Cn are considered prime farmland and prime farmland where drained, respectively. The maps units Ba and Ig are considered of statewide importance. Enclosed is the Farmland Conversion Impact Rating submitted by your office, with Part II, IV and V completed.

Also, map unit Ba is listed as a hydric soil; and map units Ce, Cn and ToA may contain hydric soil inclusions. On site investigation will be necessary to confirm the presence of wetlands.

Should you need more information, do not hesitate to contact me at (787) 766-5206, ext. 240.

Sincerely,

Carmen L. Santiago

CARMEN L. SANTIAGO
Staff Soil Scientist

Enclosure

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I (To be completed by Federal Agency)		Date Of Land Evaluation Request: 23SEP1999
Name Of Project: FLOOD CONTROL-RIO CULEBRINAS		Federal Agency Involved: US ARMY CORPS OF ENGI 5
Proposed Land Use: FLOOD CONTROL LEVEES/DYKES		County And State: AGUADILLA/AGUADA - PUERTO RICO
PART II (To be completed by SCS)		Date Request Received By SCS: 29/Sept./1999
Does the site contain prime, unique, statewide or local important farmland? (If no, the FPPA does not apply – do not complete additional parts of this form)	Yes ☒ No ☐	Acres Irrigated: 1,000 Average Farm Size: 35 acres
Major Crop(s): Plantains	Farmable Land In Govt. Jurisdiction: Acres: 111,794 % 31.6	Amount Of Farmland As Defined in FPPA: Acres: 111,794 % 31.6
Name Of Land Evaluation System Used: Mayaguez LESA	Name Of Local Site Assessment System: NONE	Date Land Evaluation Returned By SCS: Nov. 2, 1999

PART III (To be completed by Federal Agency)	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	36.55			
B. Total Acres To Be Converted Indirectly	0			
C. Total Acres In Site	36.55			
PART IV (To be completed by SCS) Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	13.0			
B. Total Acres Statewide And Local Important Farmland	7.0			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	.02%			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	19.4%			
PART V (To be completed by SCS) Land Evaluation Criterion Relative Value Of Farmland To Be Converted (Scale of 0 to 100 Points)	90			

PART VI (To be completed by Federal Agency) Site Assessment Criteria (These criteria are explained in 7 CFR 658.5(b))	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use	14	7			
2. Perimeter In Nonurban Use	9	4			
3. Percent Of Site Being Farmed	19	13			
4. Protection Provided By State And Local Government	0	0			
5. Distance From Urban Builtup Area	0	0			
6. Distance To Urban Support Services	0	0			
7. Size Of Present Farm Unit Compared To Average	9	8			
8. Creation Of Nonfarmable Farmland	25	10			
9. Availability Of Farm Support Services	0	0			
10. On-Farm Investments	0	0			
11. Effects Of Conversion On Farm Support Services	25	21			
12. Compatibility With Existing Agricultural Use	9	9			
TOTAL SITE ASSESSMENT POINTS	160	72			
PART VII (To be completed by Federal Agency)					
Relative Value Of Farmland (From Part V)	100				
Total Site Assessment (From Part VI above or a local site assessment)	160				
TOTAL POINTS (Total of above 2 lines)	260				

Site Selected: | Date Of Selection | Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

THE WORK WILL ONLY IMPACT THE FOOTPRINTS OF THE PROPOSED LEVEES. THERE IS NO ALTERNATIVE TO CONSTRUCTING THE LEVEES IF AREA FLOODING IS TO BE CONTROLLED. ANY EXISTING AGRICULTURAL ACTIVITIES IN THE ADJACENT AREA WILL NOT BE AFFECTED.

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 – Federal agencies involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form.

Step 2 – Originator will send copies A, B and C, together with maps indicating locations of site(s), to the Soil Conservation Service (SCS) local field office and retain copy D for their files. (Note: SCS has a field office in most counties in the U.S. The field office is usually located in the county seat. A list of field-office locations are available from the SCS State Conservationist in each state).

Step 3 – SCS will, within 45 calendar days after receipt of form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland.

Step 4 – In cases where farmland covered by the FPPA will be converted by the proposed project, SCS field offices will complete Parts II, IV and V of the form.

Step 5 – SCS will return copy A and B of the form to the Federal agency involved in the project. (Copy C will be retained for SCS records).

Step 6 – The Federal agency involved in the proposed project will complete Parts VI and VII of the form.

Step 7 – The Federal agency involved in the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA and the agency's internal polices.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

Part I: In completing the "County And State" questions list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: In completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them.

2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities) that will cause a direct conversion.

Part VI: Do not complete Part VI if a local site assessment is used.

Assign the maximum points for each site assessment criterion as show[illegible] §658.5(b) of CFR. In cases of corridor-type projects such as transportation, powerline and flood contro[illegible] criteria #5 and #6 will not apply and will be weighted zero, however, criterion #8 will be weighted a maximum of 25 points, and criterion #11 a maximum of 25 points.

Individual Federal agencies at the national level, may assign relative weights among the 13 site assessment criteria other than those shown in the FPPA rule. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total weight points at 160.

In rating alternative sites, Federal agencies shall consider each of the criteria and assign points within the limits established in the FPPA rule. Sites most suitable for protection under these criteria will receive the highest total scores, and sites least suitable, the lowest scores.

Part VII: In computing the "Total Site Assessment Points", where a State or local site assessment is used and the total maximum number of points is other than 160, adjust the site assessment points to a base of 160. Example: if the Site Assessment maximum is 200 points; and alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site "A."}$$

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

August 4, 1999

Colonel Joe R. Miller, District Engineer
Jacksonville District Corps of Engineers
Planning Division, Environmental Branch
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Miller:

The National Marine Fisheries Service (NMFS) has reviewed your staff's letter, dated July 7, 1999, regarding the flood protection plans being developed for a coastal segment of Cano Madre Vieja, a tributary of the Rio Culebrinas, in the Municipality of Aguadilla, Puerto Rico and the position that the project will have no effect on existing Essential Fish Habitat (EFH). According to the current plans, the proposed action consist of levee protection, upstream of the tributary mouth, that will not impact significant wetlands or involve major channel alterations of the stream. A culvert will be built to maintain a connection to an existing mangrove area and no barriers to fish migration will be constructed. No specific details are provided.

Based on our review of the general information provided, we have no comments or recommendation to offer at this time. Should there be subsequent changes in plans or additional information to indicate that there may be effects to EFH, please notify us so that we may reconsider our position on this matter. If you have any questions concerning these comments, please contact Mark Thompson of our Panama City office at 850/234-5061.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

cc:
F/SER4

OFFICE OF THE GOVERNOR
LA FORTALEZA

Control 99-2853

6 July 1999

Mr. James C. Duck
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

SHPO #05-24-91-01 *RÍO CULEBRINAS* FLOOD PROTECTION PROJECT, AGUADILLA, PUERTO RICO

Dear mister Duck:

Our Office has received and reviewed the draft report titled *Cultural Resource Survey of the Río Culebrinas Flood Protection Project, Municipio of Aguadilla, Puerto Rico*, prepared by Michael A. Cinquino, *et.al.* of Panamerican Consultants, Inc.

We concur with the consultants' recommendations for PCI/Culebrinas Site 3, Iglesia de Espinar site and PCI/Culebrinas 1. We also concur with your determination of no adverse effect on the Molino de la Hacienda Concepción and the Puente del Río Culebrinas historic structures.

Further justification is necessary, however, for the determination of non-eligibility regarding PCI/Culebrinas Site 2. Hence, a research design and work plan for a Stage II Cultural Resources Assessment of the site is hereby requested for our review and concurrence prior to its implementation.

A data recovery research design and work plan is to be prepared for all eligible sites. Its implementation, after our review and concurrence, will serve as an appropriate treatment.

Once we have concurred on the determination of eligibility for PCI/Culebrinas Site 2, and in accordance with 36 CFR 800.6, a Memorandum of Agreement is to be drafted and executed as a means to resolve the otherwise adverse effect of the undertaking on identified historic property.

Should you have any questions regarding our comments, please do not hesitate to contact our Office.

Sincerely,

Lilliane D. López, Arch.
State Historic Preservation Officer

LDL/ MB/ ABR

STATE HISTORIC PRESERVATION OFFICE
CUARTEL BALLAJÁ OFFICE 336a / BOX 82 / OLD SAN JUAN, PUERTO RICO 00901 / TELEPHONE 721-3737 / FAX 723-0957

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232-0019

REPLY TO
ATTENTION OF

July 14, 1995

Planning Division
Environmental Branch

TO ADDRESSEES ON THE ENCLOSED LIST:

The Jacksonville District, U.S. Army Corps of Engineers, is beginning to gather information to help define issues and concerns that will be addressed relative to a flood damage reduction study along the Río Culebrinas at Aguada and Aguadilla, Puerto Rico. The study area is described in the enclosure to this letter and shown on the enclosed map. We welcome your views, comments and information about natural and cultural resources, study objectives and important environmental features within the described study area, as well as any suggested improvements.

Letters of comments or inquiry should be directed to the letterhead address to the attention of Planning Division, Environmental Studies Section, within 30 days of the date of this letter. If you are aware of any other person, organization or agency that may have an interest or comments regarding this study, please inform us or notify them so they may have an opportunity to comment.

Sincerely,

A. J. Salem

A. J. Salem
Chief, Planning Division

Enclosures

MAILING LIST
AGUADA AND AGUADILLA, PUERTO RICO, SECTION 205 STUDIES

Hon. Pedro Rosselló
Governor of Puerto Rico
La Fortaleza
San Juan, PR 00901
Attn: Fed Affairs Coordinator

President,
House of Representatives
of Puerto Rico
Box 2228
San Juan PR 00901

Hon. Ramón Calero Bermúdez
Mayor, Municipio of
Aguadilla
Box 1008
Aguadilla, PR 00605

Exec Director,
PR Lands Administration
GPO Box 36-3767
San Juan PR 00936

Hon. Julio César Román
Mayor, Municipio of
Aguada
Box 517
Aguada, PR 00602

Dr. Sergio L. González Quevedo
Exec Dir PR Highways Auth
GPO Box 42007
San Juan PR 00936

Mr. Pedro Gelabert
Secretary, Dept of Natural
& Environmental Resources
Box 5887
Pta de Tierra PR 00906

Director,
PR Office of Budget and
Management
Box 3228
San Juan PR 00902

Ms Lisbeth Hyman,
Acting Asst. Director
Minerals and Water Resources
Administration, DNER
Box 5887 Pta. de Tierra
PR 00906

Director, Civil Defense
Box 5127
Puerta de Tierra PR 00906

Lic. Héctor A Russe
President, Puerto Rico
Environmental Quality Board
PO Box 11488
Santurce, PR 00919

Mr. Pedro Toledo Dávila
Superintendant, PR Police
GPO Box 70166
San Juan PR 00936

Ms. Norma E. Burgos
Chair, P.R. Planning Board
PO Box 41119 Minillas Sta
San Juan PR 00940-9985

Mr. Agustín García Acevedo
Pres, PR Telephone Co.
GPO Box 998
San Juan PR 00936

Dr. Emilio M. Colón
Executive Director, PR
Aqueduct & Sewer Auth.
PO Box 7066 Bo Obrero Sta
Santurce PR 00916

President,
PR Industrial Development Co.
GPO Box 2350
San Juan PR 00936

Secretary of Agriculture
PO Box 10163
Santurce PR 00908

Secretary, Dept of Transportation
and Public Works
PO Box 41269 Minillas Sta
Santurce, PR 00940

President,
Senado de Puerto Rico
Box 3431
San Juan PR 00904

Secretary, Dept of Recreation
and Sports
Box 3207
San Juan PR 00902

Exec. Director,
PR Land Authority
PO Box 9745
Santurce PR 00908

Administrator
Puerto Rico Economic Development
Administration
PO Box 36-2350
San Juan PR 00936

Secretary,
Puerto Rico Dept of Housing
PO Box W
Rio Piedras PR 00928

Exec Director, Public Bldgs
Authority
Box 41029
Santurce PR 00940

Dr. Arleen Pabón de Rocafort
State Historic Preservation
Officer
Office of the Governor
La Fortaleza Box 82
San Juan PR 00901

Director,
Center for Investigations
Institute of Puerto Rico
Culture
Box 4184
San Juan, PR 00905

Executive Director,
Rural Housing Administration
Po Box 21365
Río Piedras PR 00928

Exec Director
PR Electric Power Authority
GPO Box 4267
San Juan PR 00936-4267

Mr. Juan Martínez
Director Soil Conservation
Service, San Juan Office
GPO Box 4868
San Juan PR 00936

Mr. James P. Oland
Field Supervisor, FWS
Caribbean Field Office
PO Box 491
Boquerón PR 00622

Eng. Carl-Axel P Soderberg
Director, Carib Field Office
U.S. EPA
Europa Bldg Suite 417
1492 P de Leon Stop 22
Santurce PR 00909

Director,
Dept of Housing and Urban Dev.
159 Ave Chardón
New San Juan Bldg
Hato Rey, PR 00918-1804

District Chief,
Caribbean Dist., USGS WRD
GSA Center 651 Federal Drive
Suite 400-15
Guaynabo PR 00965

Natl Marine Fisheries Serv
Habitat Conservation Div. F-SER1
9721 Executive Center Drive
St. Petersburg, FL 33702

National Marine Fisheries Serv
3500 Delwood Beach Rd
Panama City FL 32407-7499

Natl Marine Fisheries Service
Miami Field Office
11420 N. Kendall Dr Ste 103
Miami Fl 33176

Regional Director, SE Region
U.S. Fish and Wildlife Service
1875 Century Blvd., Suite 200
Atlanta Ga 30345-3301

Environmental Impacts Branch
US EPA Region II
290 Broadway, 28th Floor
New York, NY 10007-1866

Executive Director
Advisory Council on
Historic Preservation
Old Post Office Bldg 809
1100 Pennsylvania Ave NW
Washington DC 20004-2590

Office of the Director
Ctr for Environmental Health
and Disease Control/F29
Center Clifton Rd
Atlanta GA 30333

Puerto Rico Conservation Trust
PO Box 4747
San Juan PR 00918

Puerto Rico Cons. Foundation
O'Neill #11 Altos
Hato Rey PR 00918

President, PR
Engineers & Surveyors' Assn
GPO Box 3845
San Juan PR 00936

PR Environmental Coalition
Cond Altos de Torrimar
90 Caribe Apt 146
Bayamon PR 00959

Dr. Gregory Morris & Assoc.
PO Box 5635
San Juan PR 00902-5635

Natural Resources Defense
Council
1350 New York Ave NW
Washington, DC 20005

RIO CULEBRINAS AT AGUADILLA AND AGUADA, PUERTO RICO
FLOOD DAMAGE REDUCTION STUDY

1.0 Project. The U.S. Army Corps of Engineers, Jacksonville District, has begun a feasibility phase study to develop a Detailed Project Report (DPR) for flood damage reduction measures in the Río Culebrinas in Aguadilla and Aguada, Puerto Rico.

2.0 Authorization and Prior Studies. Study authority is Section 205 of the 1948 Flood Control Act, as amended. Any alternative plan recommended at the completion of this study would be cost-shared by a local sponsor. (The project would be jointly funded by the Municipios of Aguada and Aguadilla.) A Reconnaissance-level study conducted during 1991 led to a report dated March 1992 which discussed an implementable plan. (See enclosed figure.)

3.0. Location and Project Features. The enclosed map shows the geographic location of the project and the considered alternative. Flood protection measures under study include construction of earthen levees to protect the south wards of Aguadilla (especially Victoria ward) and Espinar ward of Aguadilla, as shown. The study will consider alternative locations for these features and varying levels of flood protection.

4.0 Environmental Documentation. Feasibility phase investigations are planning studies undertaken after preliminary studies have indicated a probable Federal interest in developing flood reduction measures for a geographic area. The purpose of the study is to identify one or more economically and environmentally feasible plans, to prepare complete documentation of the economic and environmental effects of these plans, and to recommend a plan for authorization. Environmental compliance of the alternatives will be assessed under the National Environmental Policy Act (NEPA). The appropriate NEPA document will be circulated when the present study phase is completed and one or more alternatives have been selected. Circulation of this project description and request for comments marks the beginning of the public involvement process under NEPA. Your information and views will assist our staff to evaluate the project area, identify significant natural and cultural resources and other pertinent new issues, opportunities or concerns, and address these issues. For additional information on the Río Culebrinas flood mitigation project, please contact Barbara Cintrón (Tel. 904-232-1692) at the letterhead address.

Enclosure

US Army Corps of Engineers
Jacksonville, Florida

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

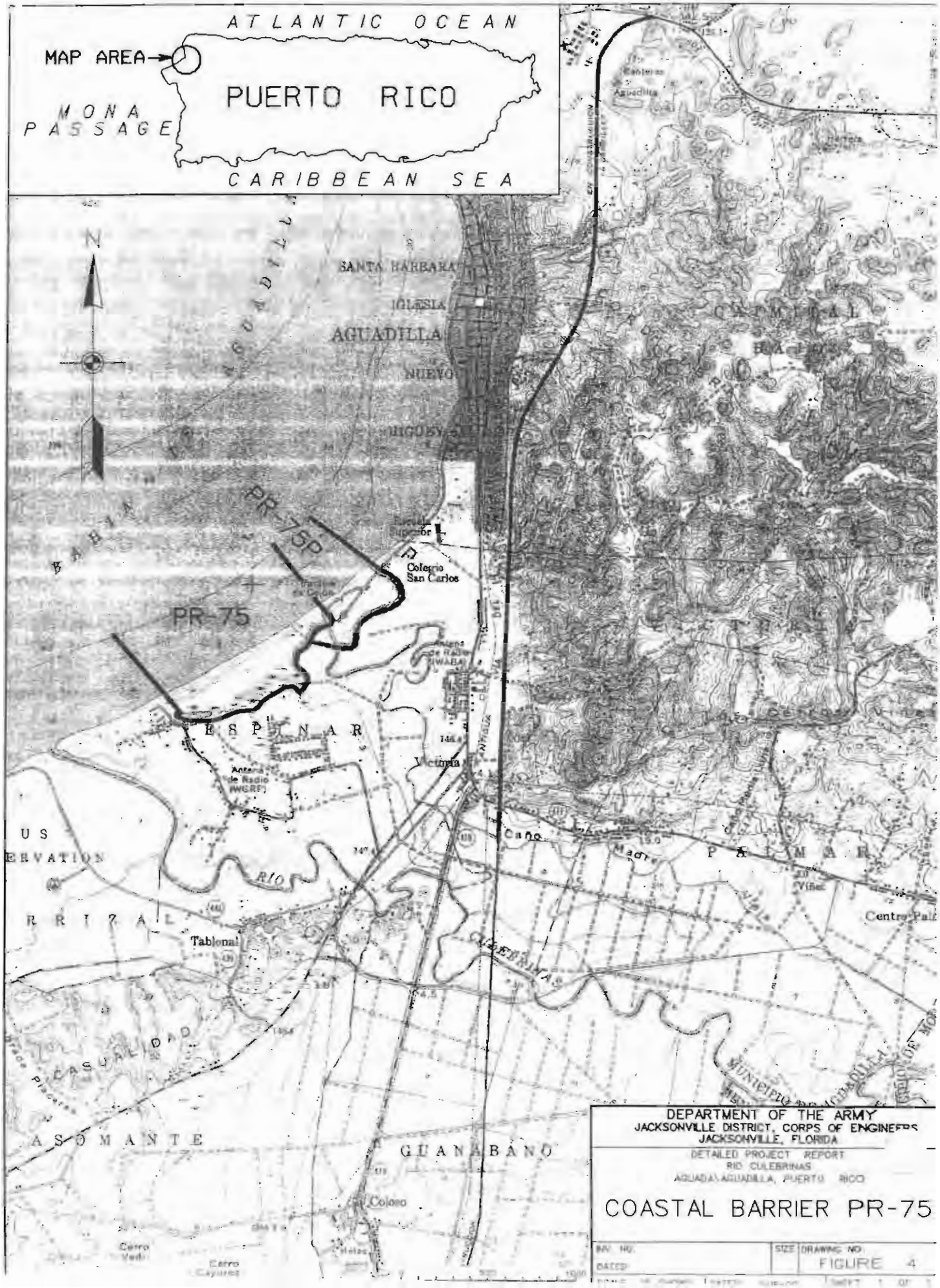
Designed by: | Detailed by: | Checked by: | Submitted by:
Date: JULY 1998
D.O. FILE NO.:

RIO CULEBRINAS AT AGUADA/AGUADILLA
PUERTO RICO

DETAILED PROJECT REPORT
RECOMMENDED PLAN

PLATE
A-2

ENCL 1



DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

DETAILED PROJECT REPORT
RIO CULEBRINAS
AGUADA\AGUADILLA, PUERTO RICO

COASTAL BARRIER PR-75

BAY NO.	SIZE	DRAWING NO.
DATED		FIGURE 4
		SHEET 1 OF 1

GOVERNMENT OF PUERTO RICO
Department of Agriculture
P O Box 10163
Santurce, Puerto Rico 00908-1163

Office of the Secretary

December 18, 1995

Mr. A. J. Salem
Chief, Planning Division
Environmental Studies Section
Department of the Army
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

Re: **Case No. 95-26(01)115-Army**
Río Culebrinas at Aguada and Aguadilla
Case No. 95-01-116-Army
Río Ojo de Agua at Aguadilla

In response to your request for our views and comments regarding the projects for flood control along Río Culebrinas at Aguada and Aguadilla, and Río Ojo de Agua at Aguadilla, the Department of Agriculture proceeded to evaluate the affected area. The area is highly susceptible to flooding, and every year during the rainy season residential areas as well as agricultural land are subjected to flood damage.

The proposed projects will have a very positive impact on the community and will also favored the agricultural activities in the area. Most of the agricultural land along the Culebrinas River is dedicated to sugarcane production. Although, sugarcane is a highly tolerant crop to adverse conditions, heavy rainfall and flooding during harvesting reduce significantly sugar content. Consequently, the establishment of a flooding control system will contribute to increase sugarcane yields in the nearby farms.

Sincerely,

Miguel A. Muñoz
Undersecretary of Agriculture

PUERTO RICO ELECTRIC POWER AUTHORITY

San Juan, Puerto Rico

Cable Address
PREPA

P O Box 364267
San Juan, Puerto Rico 00936-4267

September 12, 1995

Department of the Army
Jacksonville District
Corps of Engineers
PO Box 4970
Jacksonville, Florida 32232-0019

ATT: Planning Division, Environmental Studies Section

Gentlemen:

As of the moment, our Agency does not have any comments or information regarding outstanding environmental features, natural and cultural resources or study objectives relative to the flood damage reduction study along the Río Culebrinas at Aguada and Aguadilla. Nevertheless, during the final design stages of this project, we should be consulted in relation to possible interferences with our electrical system infrastructure.

For future inquiries please contact Eng. Rafael Meléndez, Interim Electrical Distribution Superintendent, at (809) 289-3062 or (809) 289-3034 at your earliest convenience.

Cordially,

Angel L. Rivera Santana
Director, Planning and
Environmental Protection

COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF HOUSING
VIVIENDA

August 30, 1995

Mr. A.J. Salem

Chief, Planning Division
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

ATT: Mrs. Barbara Cintrón
Planning Division
Environmental Branch

Dear Mr. Salem:

In reference to your request for comments we are submitting information of surrounding communities relative to a flood damage reduction study along the Rio Culebrinas in Aguadilla and Aguada, Puerto Rico.

Name of Community: Comunidad Espinar
Location: State Road 442, Km. 0.5, Aguadilla, Puerto Rico
Established: June 24, 1956
Number of Families: 203

Name of Community: Comunidad Tablonal
Location: State Road 900, Km. 0.3, Aguada, Puerto Rico
Established: April 19, 1986
Number of Families: 242

Name of Community: Comunidad Las Corozas
Location: State Road 417, Km. 1, Aguada, Puerto Rico
Established: June 11, 1944
Number of Families: 187

We enclosed a U.S.G.S. Quadrangle of Aguadilla pointing the developed communities in the municipalities Aguadilla and Aguada.

The Department of Housing endorse the flood protection measures under study to protect the south wards of Aguadilla.

Cordially,

Luz D. Estrella Juarbe

Luz I. Estrella Juarbe
Assistant Secretary
for Planning and Technical Services

Enclosure
FRR/DV/LEJ/lar

PRT Puerto Rico Telephone Company
TELEFONICA PUERTO RICO

August 29,1995

Mr. A. J. Salem
Chief, Planning Division
Department of the Army
P.O. Box 4970 Jacksonville,
Florida 32232-0019

Dear Mr. Salem:

We has revised the map enclosed in your letter related to the studies that the U.S. Army Corps of Engineers are developing for flood damage reduction along Río Culebrinas and Río Ojo de Agua at Aguadilla and Aguada region.

The reference area was examinated considering our outside plant, and we did not found any telephone facilities affected with your project.

If your agency understand that the final study and maps should be verify by our Company before the implementation of the jobs, do not hesitate to contact us.

truly yours,

Ing. Roberto Correa
Director,
Planning Department
P.R. Telephone Co.

P.O. Box 60198 San Juan, Puerto Rico 00936-0998

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

Centro Gubernamental Minillas, Edificio Norte
Ave. De Diego, Pda. 22
P.O. Box 41119, SAN JUAN, PUERTO RICO 00940-1119

rec'd Aug 91

A.J. Salem
Chief, Planning Division
Department of the Army
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention: Planning Division
Environmental Branch

Dear Mr. Salem:

This is in reference to your request for comments on the feasibility phase study for the investigation of flood damage reduction measures to protect the Victoria and Espinar wards of the municipality of Aguadilla and Aguada from Rio Culebrinas floods.

The proposed flood protection measure includes the construction of earthen levees to protect the above mentioned sectors. According to FEMA's panel number 720000-0009D, both sectors were affected by the 100 year flood and were located within the designated floodway of Rio Culebrinas. The location of the levees may have impact in the floodway limits and the base flood elevations. This impact could be discussed in the detailed project report.

In relation to Espinar ward in public hearings conducted by the Planning Board about the regional plan, Aguada citizens expressed interest on the protection of the Espinar mangrove and the "Ermita Espinar". We also recommend to evaluate the impact of the 100 year flood of Rio Culebrinas in the Caño Madre Vieja flood levels, upstream and downstream of the bridge of Highway PR-2. The proposed alternative for the flood protection does not affect the Land Use Plans for both municipalities.

Cordially,

por Jose R. Caballero Mercado
Norma E. Burgos Andújar
Chairwoman

BAM/RMM/mia

OFFICE OF THE GOVERNOR
LA FORTALEZA

Control 95-2616

August 18, 1995

Mr. A. J. Salem
Chief, Planning Division
Environmental Resources Branch
Jacksonville District Corps of Engineers
P. O. Box 4970
Jacksonville, FL 32232-0019

SHPO 06-17-94-29 CHANNALIZATION STUDIES CULEBRINAS RIVER, AGUADILLA, PUERTO RICO

Dear Mr. Salem:

In response to your July 14, 1995 notice, we have reviewed our files concerning the above referenced project. Our records do not locate any known historic property along the project area, although it is believed that a sixteenth century Spanish hermitage may have been located in the area of the present day Espinar community. It is our recommendation that a cultural resources assessment of the area of potential effects be undertaken to establish the presence or absence of cultural resources.

If you have any questions or comments, please do not hesitate to contact our State Archaeologist Miguel Bonini in our Office. Your interest and cooperation in helping to protect Puerto Rico's archaeological and historical resources are appreciated.

Cordially,

Lilliane D. López

Lilliane D. López, Arch.
State Historic Preservation Officer

LDL/MB/

STATE HISTORIC PRESERVATION OFFICE
SAN JOSE ST. # 109 / BOX 82 / OLD SAN JUAN, PUERTO RICO 00901 / TELEPHONE 721-3737 / FAX 723-0957

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY - REGION II
290 BROADWAY
NEW YORK, NEW YORK 10007-1866

AUG 16 1995

Mr. A. J. Salem, Chief
Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

The Environmental Protection Agency (EPA) has reviewed the feasibility phase study to develop a detailed project report for flood damage reduction measures in the Rio Culebrinas in Aguadilla and Aguada, Puerto Rico. Flood protection measures being considered include construction of earthen levees; alternative locations for these structures and varying levels of flood protection will be studied. In addition to the standard range of topics covered by environmental documentation developed pursuant to the National Environmental Policy Act, we recommend that your environmental documentation include the following elements.

- A description of the aquatic and terrestrial environments to be impacted by each alternative should include the identification and delineation of all wetlands, the identification of floodplains and cultural resources, and the identification of other significant environmental resources in the project area. This description should also include an evaluation of the potential for encountering any contamination in the study area.

- An evaluation of the potential environmental impacts associated with the proposed project should include analyses of impacts to wetlands, water quality, floodplains, coastal zones, cultural resources, and other significant aspects of the environment. If the environmental document determines that adverse impacts to environmental resources are unavoidable, measures to mitigate these impacts must be developed and discussed in the document.

- Sedimentation and erosion impacts should be evaluated. Specifically, please provide information regarding erosion control during project implementation, and an evaluation of erosion and sedimentation impacts to Aguadilla Bay.

Thank you for the opportunity to comment. If you have any questions concerning this letter, please contact Ms. Evelyn Tapani-Rosenthal of my staff at (212) 637-3497.

Sincerely yours,

Laura Livingston

Laura J. Livingston, Assistant Chief
Environmental Impacts Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

August 8, 1995

904/234-5061

Colonel Terry Rice
District Engineer, Jacksonville District
Department of the Army, Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Dear Colonel Rice:

The National Marine Fisheries Service (NMFS) has reviewed the notice dated July 14, 1995 with a due date of August 13, 1995, regarding the flood reduction study along the Río Culebrina at Aguada and Aguadilla, Puerto Rico. The project features include construction of an earthen levee to protect the south wards of Aguadilla, (i.e., Victoria and Espinar).

Based on the information contained in the notice, we anticipate that any adverse effect that might occur on marine and anadromous fishery resources would be minimal. The project would impact areas that are predominantly agricultural and of little habitat value. We therefore have no additional comments to provide on this project.

Sincerely,

Andreas Mager, Jr.
Assistant Regional Director
Habitat Conservation Division

cc:
Mr. A. J. Salem
Chief, Planning Division
Environmental Branch
Department of the Army, Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

F/SEO2
F/SEO23-MIAMI

DEPARTAMENTO DE RECURSOS NATURALES

October 9, 1991

Mr. A. J. Salem
Department of the Army
Jacksonville District of
Engineers
P.O. Box 4970
Jacksonville, FL. 32232-0019

Dear mister Salem:

The Department of Natural Resources, DNR carried out an analysis of the Recoconnaissance Studies of the Ojo de Agua River, Culebrinas River and Madre Vieja Creek in Aguadilla in which the following comments are submitted.

We understand that it is necessary to take protective measured for the urban center and southern area of Aguadilla. In addition, consideration should be given to the feasibility of constructing works for the prevention of erosion (conservation of soils due to runoff from the Jaicoa hills).

The area flooded by Ojo de Agua River in the urban center of Aguadilla is affected by the overflow of the water channel that runs from east to west. Because of the intensity of precipitacion, and the lack of hydraulic capacity, the channel is inadequated to carry the flood flows through the central area of Aguadilla.

The urban area proposed for channeling does not present any limitations; however, consideration must be given to its effect on the natural communities within the river (particularly fish, shrimp and mollusk).

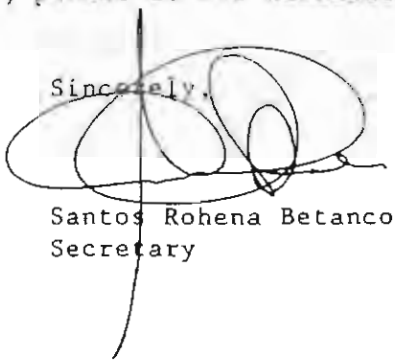
CULEBRINAS RIVER AND MADRE VIEJA CREEK

Most of the area included in the drainage basin is made up steep hills both include extensive coastal wetland areas, predominantly marshy.

It is recommended that the CoE assures the potencial impact of this project on the wetlands area's, since even if it is not an acknowledge habitat, it could be important in diverting flood waters of both bodies of water.

Finally, the Department recommends considering which will be the negative impact on these projects. As shown in topographical map there exists a large space between the area of both projects. If you need any other assistance during the study, please do not hesitate to contact our Department.

Sincerely,



Santos Rohena Betancourt
Secretary

United States Department of the Interior

FISH AND WILDLIFE SERVICE
CARIBBEAN FIELD OFFICE
P.O. BOX 491
BOQUERON, PUERTO RICO 00622

July 5, 1991

Mr. A. J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232

Re: Flood Control Protection
Rio Culebrinas, Caño
Madre Vieja, Aguadilla, PR

Dear Mr. Salem:

This is in reply to your request for comments on the above referenced Flood Control project. The Rio Culebrinas in Aguadilla is well known for its population of native river shrimp (Macrobrachium carcinus). This shrimp is caught locally and sold. A small estuarine wetland is located at the mouth of the Culebrinas. The Culebrinas is also hydrologically connected to the nearby Cayures Swamp (see map). This freshwater wetland provides important habitat to the rare masked duck Oxyura dominica. Any channel improvements or structural improvements that might affect stream habitat for the shrimp and water flow into the estuary or swamp, will have to be carefully considered. If you have any questions please contact Felix Lopez of my staff.

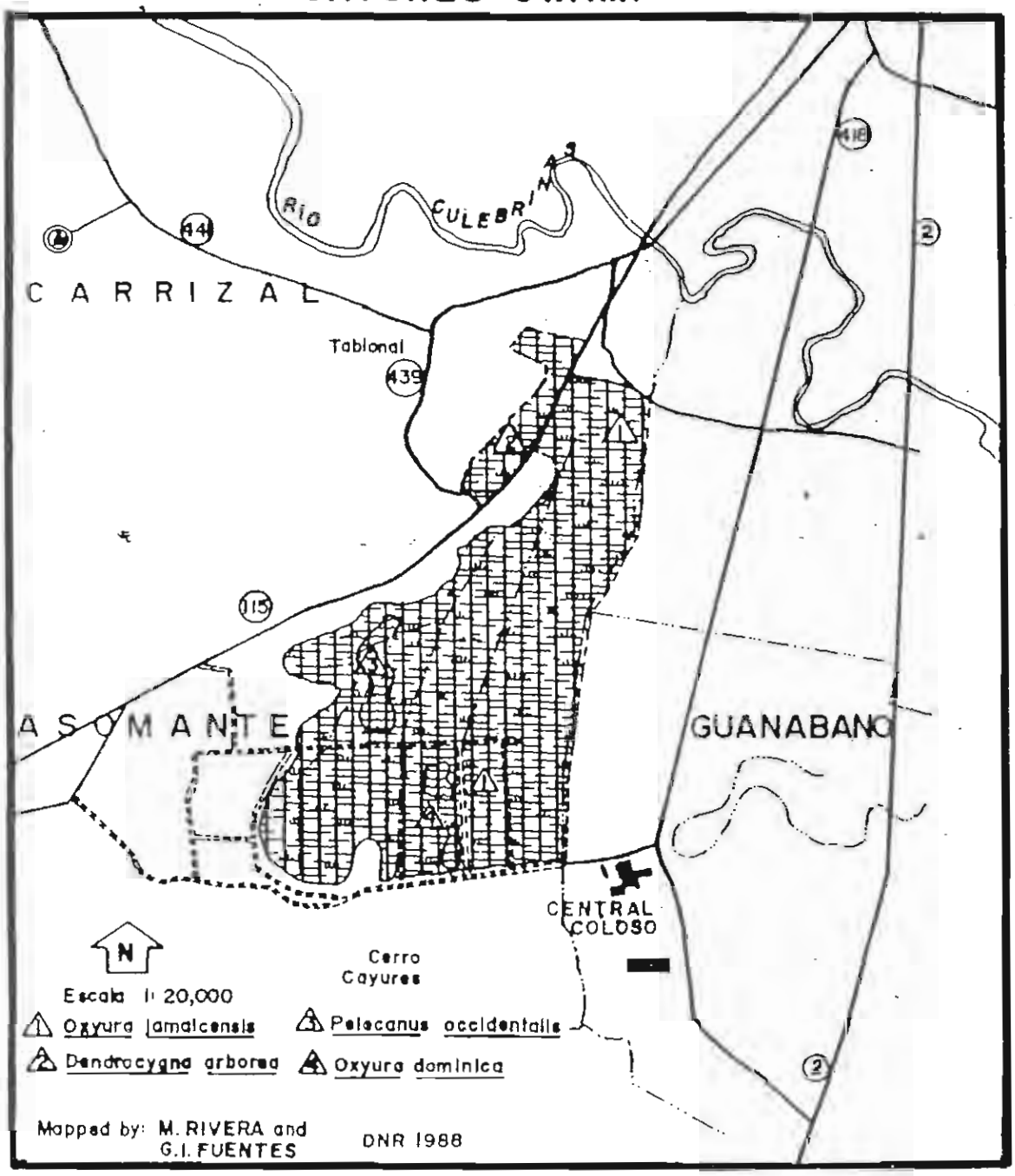
Sincerely,

James P. Oland

James P. Oland
Field Supervisor

encl (1)
fhl
cc:
COE, San Juan

CAYURES SWAMP



MAP 14

ESTADO LIBRE ASOCIADO DE PUERTO RICO
ADMINISTRACION DE SERVICIOS MUNICIPALES
EDIF. PLAZA BARBOSA - AVE. BARBOSA 306
HATO REY, PUERTO RICO 00917
GPO BOX 70167, SAN JUAN, P.R. 00936
TEL.: 754-1600

June 20, 1991

Mr. A. J. Salem
Chief, Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 3232-0019

Dear Mr. Salem:

Reference is made to your letter dated April 26, regarding flood protection along the Río Culebrinas and Caño Madre Vieja, south of Aguadilla.

As determined by our Engineering Bureau, both rivers running in a western direction, cross State Road PR-418 and previous PR-2, affecting a large community on normal flooding. This includes residential users, agricultural, a radio station control and antenna, plus a U. S. Reservation on the southwest bank of Río Culebrinas.

A more detailed reconnaissance of the area demonstrated that the agricultural land flooded by Río Culebrinas is a rich one used for cattle raising and includes several structures that possibly will interfere with any canalization project. At the same time Caño Madre Vieja is affected by a long extension of "mangle" which is under control by the Department of Natural Resources.

A detailed study of land located East of State Roads PR-418 and present PR-2, demonstrates that Caño Madre Vieja receives waters from Río Culebrinas which can be controled by a filling or leveling project, leaving its channel for local run-off or storm sewers in the area. This will reduce flood danger to a minimum, and will permit the Municipality to develop the area for recreational purposes.

Flood control of Río Culebrinas from State Road PR-418 to the beach, crossing former State Road PR-2, can be improved by straightening some sections or loops and building an earthen "levee" within the channel and area to be protected.

Cordially,

Luz Delia Oquendo
Acting Administrator

COLEGIO DE INGENIEROS Y AGRIMENSORES DE PUERTO RICO

June 20, 1991

Mr. A. J. Salem
Chief Planning Division
Environmental Resources Branch
P O Box 4970
Jacksonville, Florida 32232-0019

Dear Mr. Salem:

Your request for comments and information was referred to this office after the May 26, 1991 deadline.

Please be advised that Eng. Samuel Rosario passed away on May 10, 1990 and at present our President is Miguel A. Roa Vargas. Our new address is as follows:

Colegio de Ingenieros y Agrimensores de P.R.
P O Box 363845
San Juan, P.R. 00936-3845

We will be eager in future issues to offer our comments or inquiries to your office.

Sincerely,

Juan R. Figueroa Laugier, P.E.
Executive Director

JRFL/id

xc: Miguel A. Roa Vargas, P.E.
José E. Valls, P.E.
Ponce Chapter President

United States Department of the Interior

FISH AND WILDLIFE SERVICE
CARIBBEAN FIELD OFFICE
P.O. BOX 491
BOQUERON, PUERTO RICO 00622

June 12, 1991

Mr. A. J. Salem
Chief, Planning Division
U.S. Army Corp of Engineers
Jacksonville District Office
P.O. Box 4970
Jacksonville, FL 32232-0019

Dear Mr. Salem:

This is in response to a letter of May 15, 1991 received in this office on May 20, 1991 requesting a list of any threatened or endangered species that may be present in the study area for the flood protection project along Rio Culebrinas, Aguadilla.

After reviewing our files we found that no threatened or endangered species occur near the proposed study area. However, we consider that the Espinar wetland, northwest of the proposed site, may be affected by the proposed Diversion Channel. This channel may eventually drain the Caño Madre Vieja which directly connects with the coastal wetland.

This office does not favorably endorse any activities which may affect wetlands, therefore, we suggest that the possible impacts of the Diversion Island on the Espinar wetland be evaluated.

Should you have any questions, please contact Jorge E. Saliva from our office at 851-7297.

Sincerely,

Susan R. Silander
Acting Field Supervisor

jes
cc: DNR, Natural Heritage Program
EPA, San Juan

RECEIVED
JUN 20 1991
SJAO
Regulatory/Section

COMMONWEALTH OF PUERTO RICO
OFFICE OF THE GOVERNOR
PUERTO RICO PLANNING BOARD

Minillas Governmental Center, North Bldg.
De Diego Ave, Stop 22
P. O. Box 41119, San Juan, P. R. 00940 - 1119

June 4, 1991

A. J. Salem, Chief
Planning Division
Department of the Army
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida - 32232-0019

Att: Environmental Studies Section

Dear Mr. Salem:

I write in reference to your request for comments on the reconnaissance-level report for the Río Culebrinas and Caño Madre Vieja flood protection project, south of the Municipality of Aguadilla. Historical records show that the area west of Highway PR-2 has been affected by floods of both Río Culebrinas and the Caño.

According to FEMA's panel number 720000-0009B and our Flood Zones Map number 1D, Urb. García, Urb. Victoria and the Public Housing Project José Aponte were affected by the 100 year-flood, and were classified within the floodway. Urban development was restricted because of the floods, as shown in dotted lines, in our Land Use Plan for Aguadilla, (corresponding parts included). The Plan also proposes that the lands located northeast and adjacent to the mouth of Caño Madre Vieja be used for recreational uses.

Any additional information that you may need will be furnished on request.

Cordially,

Patria G. Custodio
Chairperson

Enclosure

DEPARTMENT OF NATURAL RESOURCES

May 23, 1991

Mr. A. J. Salem
Chief, Planning Division
Department of the Army
Jacksonville District
Corps of Engineers
PO Box 4970
Jacksonville Florida 32232-0019

Attn: Environmental Studies Section

Dear Mr. Salem:

Re: Reconnaissance Study Rio Culebrinas and Caño Madre Vieja, Aguadilla

The Flood Control Area of the Department of Natural Resources is aware of the problems of flooding south of the town of Aguadilla. At the present time, our Area is not considering any projects to provide flood protection to the municipality of Aguadilla.

If our assistance is needed during the study, please feel free to contact our Area.

Sincerely,

Hilton Miró Detrés
Assistant Secretary
Flood Control Area

LH/JAA/lic

COMMONWEALTH OF PUERTO RICO
DEPARTMENT OF AGRICULTURE

P.O. Box 10163
Santurce, Puerto Rico 00908

OFFICE OF THE SECRETARY

May 17, 1991

Mr. A.J. Salem
Chief Planning Division
Department of the Army
Jacksonville District Corps
of Engineers
PO Box 4970
Jacksonville, Florida 32232

Dear Mr. Salem:

Your proposal for a reconnaissance-level report for flood protection along the Río Culebrinas and Caño Madre Vieja, South of Aguadilla, Puerto Rico, is important for the area and for the agricultural development. One of our greatest sugarcane mill is located close to the Río Culebrinas and Caño Madre Vieja. This river is a source of water for the Coloso Mill.

Sugarcane, pasture and other crops are cultivated throughout the area.

We understand that a protection against flooding will help our farmers in the area.

If you need more information, do not hesitate to contact me.

Sincerely yours,

Alfonso L. Dávila Silva
Secretary of Agriculture

LAND ADMINISTRATION
COMMONWEALTH OF PUERTO RICO

Address all correspondence to the
Executive Director
PEDRO HERNANDEZ-PURCELL

June 3, 1991

Mr. A. J. Salem
Chief, Planning Division
Environmental Resources Branch
Department of the Army
Jacksonville Corps of Engineers
P O. Box 4970
Jacksonville, Florida 32232-0019

Re: Possible alternatives for flood protection along Ríos Ojo de Agua, Río Culebrinas, Caño Madre Vieja, Aquadilla, Puerto Rico and Río Loco, Guánica, Puerto Rico

Dear Mr. Salem:

Reference is made to your letters of April 29, May 1, and April 26, you asked for our opinion on the above reference subjects.

Due to the preliminary content of the information, we cannot offer an opinion on the project.

We will comment and evaluate any document with the alternative proposed when these are presented to our agency.

Cordially,

Pedro Hernández-Purcell
Executive Director

cc: Agrim. Román Aulet
Eng. Mojica

916 chardón ave. tres monjitas, hato rey, p.o. box 363767, san juan. p.r. 00936-3767, tel. 756-5555 / fax. 765-6334

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OFICINA DEL GOBERNADOR
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SAN JUAN DE PUERTO RICO

MARIANO GERARDO CORONAS CASTRO
DIRECTOR / OFICIAL

91 JUL 16 AM 8:38

May 30, 1991

Mr. A. J. Salem
Chief
Planning Division
Department of the Army
Jacksonville District Corps of Engineers
P. O. Box 4970
Jacksonville, Fla 32232-0019

RE: SHPO 05-24-91-01 FLOOD PROTECTION PROJECT OF RIO CULEBRINES AND CAÑO MADRE FLOOD CONTROL PROJECT, AGUADILLA, PUERTO RICO

Dear Mr. Salem:

Our staff has reviewed the preliminary information for the above referenced project.

The general area is ecological very sensitive. The coastal swamp, the Culebrines river and the Caño Madre Vieja make this an ideal area for location of indian sites. In addition we have reports of some sites within the Espinar Sector, inside the triangle form by the three natural resources. Therefore, we have determined that a cultural resources study (Stage IA-IB) should be carried out to locate potential archaeological sites in the project area, prior to any construction or earthmovement.

If you have any questions, please contact State Archaeologist Dr. Michael A. Cinquino at our Office. Your interest and cooperation in helping to protect Puerto Rico's historical and archaeological resources are appreciated.

Cordially yours,

Luis F. Irizarry
Deputy SHPO

OFICINA ESTATAL DE PRESERVACION HISTORICA
OFICINA DEL GOBERNADOR

LFI/asc/91-2618

cc: Mr. Carmelo Cáez
US COE, San Juan

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MARIANO GERARDO CORONAS CASTRO
DIRECTOR / OFICIAL

Fecha:05/24/91
Núm. Control Recibo: 91-2619
Ref. No. SHPO: 08-21-90-01
Descripcción del Proyecto:
RIO CULEBRINAS AND CANO
MADRE, AGUADILLA

MR. A. J. SALEM
DEPARTMENT OF THE ARMY
BOX 4970
JACKSONVILLE FL 32232

Estimado señor(a): SALEM

Acusamos recibo de los documentos sometidos a nuestra oficina para evaluación y endoso, el 24 de mayo de 1991.

Su caso tiene asignado el número de referencia (SHPO No.) escrito en la parte superior derecha de este acuse de recibo de documentos. Si tiene cualquier duda o pregunta, refiérase a dicho número para localizar rápidamente el expediente. Nuestra oficina se comunicará con usted en un término razonable, el cual estimamos no debe exceder los próximos treinta (30) días laborables, a los efectos de emitir sanción favorable, de denegación o recabar información adicional necesaria para la evaluación del proyecto, en correspondencia a la normativa federal aplicable.

De surgir cualquier duda respecto al proceso de evaluación, puede comunicarse con nuestro funcionario el Arq. Luis Fernando Irizarry, asistente del que suscribe a cargo del Programa Estatal de Preservación Histórica.

Sin otro particular al cual referirme, aprovecho la oportunidad para reiterarle mi consideración más distinguida.

Mariano G. Coronas Castro
Oficial Estatal

COMMONWEALTH OF PUERTO RICO
PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY
G.P.O. BOX 2350 SAN JUAN, PUERTO RICO 00936

TELEX: 3252678
3654319
3855285

91 MAY 30 PM

May 14, 1991

Department of the Army
Jacksonville District Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attention: Mr. A. J. Salem
Chief, Planning Division
Environmental Studies Section

Dear Mr. Salem:

Re: Reconnaissance - level report for flood protection along the Río Culebrinas and Caño Madre Vieja in Aguadilla

This refers to your notice of April 26, 1991, about the proposed first phase of the study mentioned above.

We considered this study as a very important and useful first step planned by the Corps of Engineers in Aguadilla. If the feasibility phase of the study is recommended because it is found that the project is implementable and eventually, the necessary funds are available to realize the project, the municipality of Aguadilla will have plenty land to develop. Currently, the whole flat land located west and east of Road PR-2 and north and south along of Río Culebrinas and Caño Madre Vieja are affected by floods. See map included.

Unfortunately, we have not been able to identify any information in our hands that would be useful to you in this phase of the study. We own no properties in the study area.

We do want, however, to congratulate the Corps of Engineers for coming up with this most needed study.

Sincerely,

Miguel A. Rivera Carrasquillo
Development Vice President

Enclosure

B. FISH AND WILDLIFE COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Boqueron Field Office
P.O. Box 491
Boqueron, Puerto Rico 00622

November 19, 1999

Mr. James C. Duck, Chief
Jacksonville District Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232-0019

Attn. Mr. Esteban Jiménez

Re: Coordination Act Report
Culebrinas River Flood Control Project

Dear Mr. Duck :

Enclosed please find an original and 1 copy of the Fish and Wildlife Service Coordination Act Report for the proposed Culebrinas River flood control project. Another copy has been provided to the Antilles Area Office, Planning Division, and a copy has been sent to the Department of Natural and Environmental Resources.

The Coordination Act Report discusses the fish and wildlife resources of the area and points out that a portion of the proposed project, the north end of the west levee, would fall within a designated Coastal Barrier Unit. The Service would like the opportunity to provide further Coordination Act comments if modifications are planned for this project.

Thank you for the opportunity to comment on this action.

Sincerely yours,

James P. Oland
Field Supervisor

bby
cc:
DNER, San Juan
COE, San Juan