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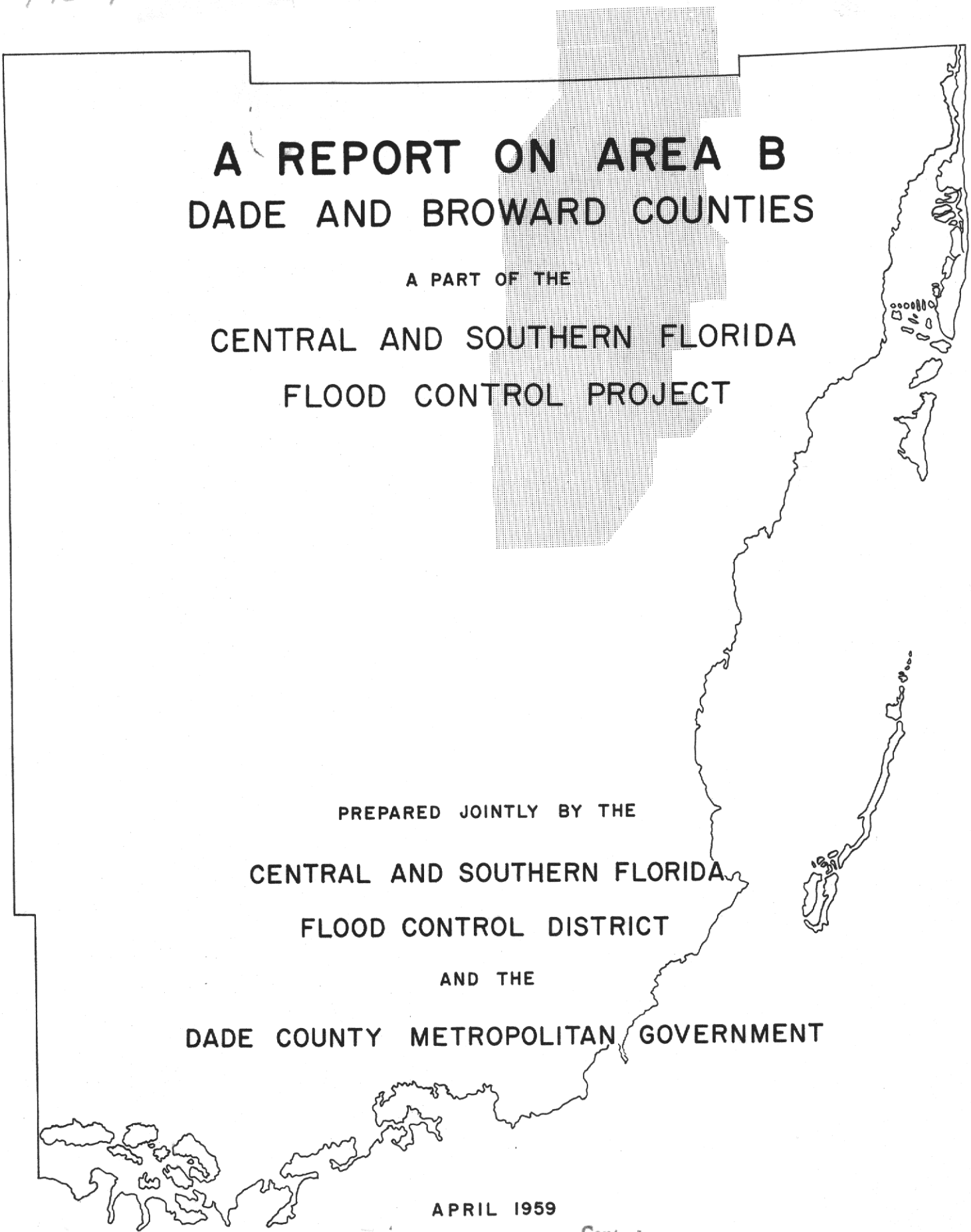
A REPORT ON AREA B
DADE AND BROWARD COUNTIES

A PART OF THE

CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL PROJECT



PREPARED JOINTLY BY THE

CENTRAL AND SOUTHERN FLORIDA
FLOOD CONTROL DISTRICT

AND THE

DADE COUNTY METROPOLITAN GOVERNMENT

APRIL 1959

627-41

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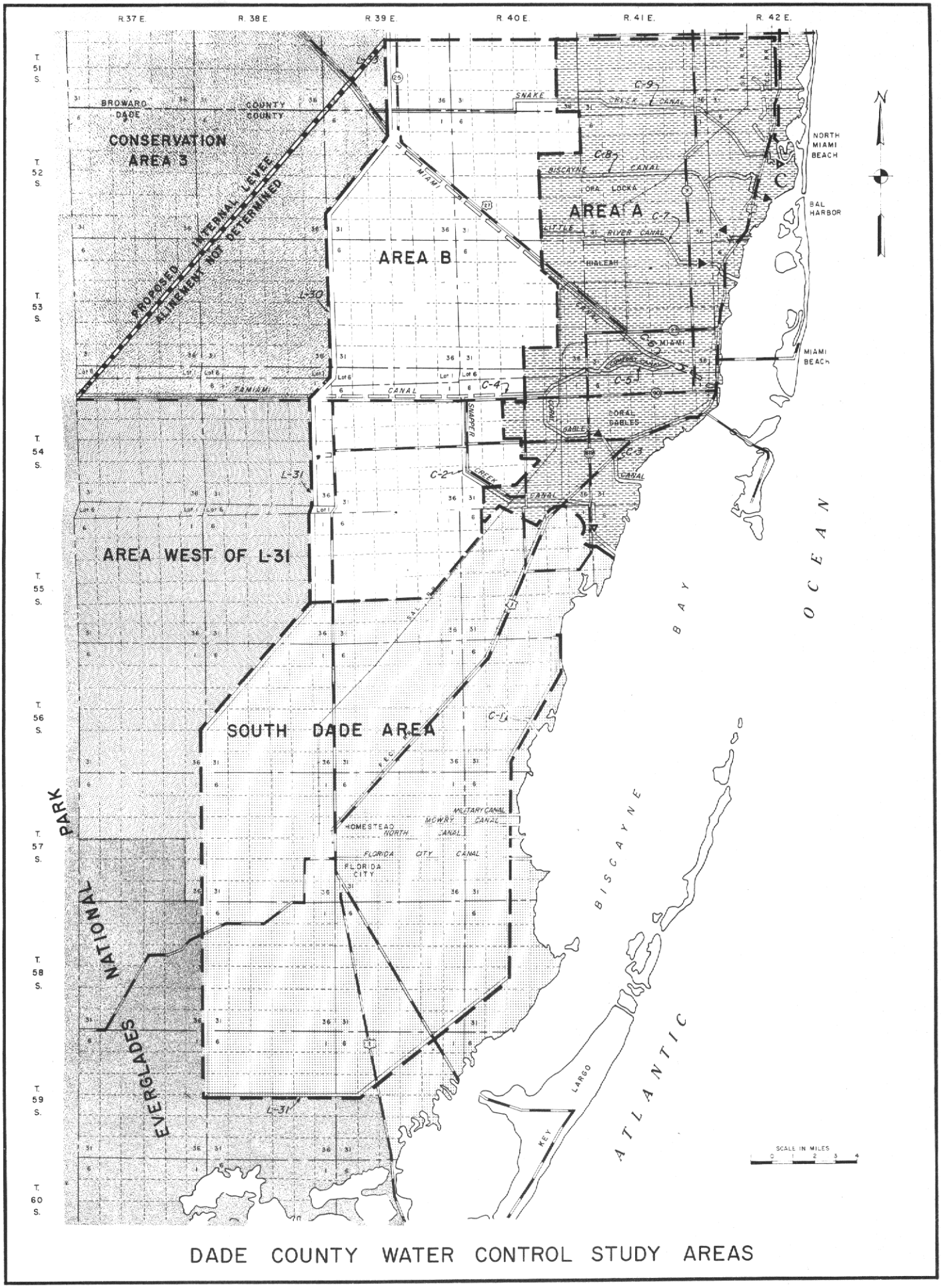
A REPORT ON AREA B, DADE COUNTY
A PART OF THE
CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL PROJECT

Prepared jointly by the
Central and Southern Florida Flood Control District
and the
Dade County Metropolitan Government



DADE COUNTY WATER CONTROL STUDY AREAS

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of the

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MR. W. TURNER WALLIS, Consulting Engineer

RESOLUTION NO. 382

ADOPTING CONCLUSIONS AND RECOMMENDATIONS OF THE JOINT REPORT OF CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT AND METROPOLITAN DADE COUNTY ADDRESSED TO THE BOARD OF ENGINEERS OF RIVERS AND HARBORS, U. S. ARMY CORPS OF ENGINEERS, CONCERNING AREA "B", DADE COUNTY, FLORIDA

WHEREAS, the District Engineer, Jacksonville District, Corps of Engineers, U. S. Army prepared a Survey Review Report dated July 9, 1958 concerning Area "B", Dade County, Florida; and

WHEREAS, the findings of said report were concurred in by the South Atlantic Division Engineers, Corps of Engineers, U. S. Army; and

WHEREAS, said report, which was submitted to the Board of Engineers of Rivers and Harbors, U. S. Army Corps of Engineers, found there was no essential Federal interest in a project for Area "B" and therefore recommended that the Federal government not participate in providing a project for Area "B"; and

WHEREAS, the Central and Southern Florida Flood Control District and Metropolitan Dade County have developed additional information not considered in the report of the District Engineer which indicates that there is, in fact, a Federal interest in a project for Area "B"; and

WHEREAS, the Central and Southern Florida Flood Control District and Metropolitan Dade County have jointly prepared a report setting forth the above additional information and, in addition, have presented in that report a feasible engineering plan for a project for Area "B".

NOW THEREFORE BE IT RESOLVED by the Governing Board of Central and Southern Florida Flood Control District that it does hereby adopt the conclusions and recommendations of the joint report of Central and Southern Florida Flood Control District and Metropolitan Dade County addressed to the Board of Engineers of Rivers and Harbors, U. S. Army Corps of Engineers, concerning Area "B", Dade County, Florida.

PASSED AND ADOPTED, this the 9th day of April, A. D., 1959.

CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, BY ITS GOVERNING BOARD

By _____
Chairman

(Corporate Seal)

ATTEST:

_____
Secretary

RESOLUTION NO. 3093
April 21, 1959

RESOLUTION APPROVING AND ADOPTING CONCLUSIONS AND RECOMMENDATIONS CONTAINED IN JOINT REPORT OF CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT AND DADE COUNTY DEPARTMENT OF PUBLIC WORKS ADDRESSED TO THE BOARD OF ENGINEERS OF RIVERS AND HARBORS, U. S. ARMY CORPS OF ENGINEERS, RELATIVE TO "AREA B", DADE COUNTY, FLORIDA.

WHEREAS, the District Engineer, Jacksonville District, Corps of Engineers, U. S. Army, prepared a Survey Review Report dated July 9, 1958, concerning Area "B", Dade County, Florida; and

WHEREAS, the findings of said report were concurred in by the South Atlantic Division Engineer, Corps of Engineers, U. S. Army; and

WHEREAS, said report, submitted to the Board of Engineers of Rivers and Harbors, U. S. Army Corps of Engineers, found there was no essential Federal interest in a project for Area "B" and therefore recommended that the Federal government not participate in providing a project for Area "B"; and

WHEREAS, the Central and Southern Florida Flood Control District and Metropolitan Dade County have developed additional information not considered in the report of the District Engineer which indicates that there is, in fact, a Federal interest in a project for Area "B"; and

WHEREAS, the Central and Southern Florida Flood Control District and Metropolitan Dade County have jointly prepared a report setting forth the above additional information and, in addition, have presented in that report a feasible engineering plan for a project for Area "B",

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF DADE COUNTY, FLORIDA, that it does hereby adopt the conclusions and recommendations of the joint report of Central and Southern Florida Flood Control District and Metropolitan Dade County addressed to the Board of Engineers of Rivers and Harbors, U. S. Army Corps of Engineers, concerning Area "B", Dade County, Florida.

AND BE IT FURTHER RESOLVED that the Board of Engineers of Rivers and Harbors, U. S. Army Corps of Engineers, is hereby respectfully requested and urged to direct the District Engineer, Jacksonville District, Corps of Engineers, U. S. Army, to review and reconsider the matter of responsibility for water control in Area "B" in the light of the evidence presented by the joint report of the Central and Southern Florida Flood Control District and the Metropolitan Dade County Department of Public Works.

BOARD OF COUNTY COMMISSIONERS
DADE COUNTY, FLORIDA

SYLLABUS

This Report presents the comments of local interests concerning the inclusion of Area B, Dade County as an authorized part of the Central and Southern Florida Project. The Report summarizes briefly the history of Area B, Dade County. A resume of local activity in efforts at the local county and state level to construct facilities for flood control and water conservation are briefed in the Report.

The Report emphasizes that the Central and Southern Florida Project was authorized under the provisions of the Flood Control Act of June 22, 1936, as modified by Section 2 of the Act of December 22, 1944. The Project is one which produces important benefits of land enhancement. This fact was recognized in the original Project document submitted to Congress in 1948. Benefits of land enhancement are, in the opinion of the Bureau of the Budget, primary benefits which can properly be utilized in the justification of Flood Control Projects in the Federal program. Land enhancement benefits are generally local in character and therefore, in the opinion of the Bureau of the Budget, present justification for requiring that local interests contribute to the cost of construction of a system of works producing benefits of this classification.

Local interests take issue with the District Engineer's findings and recommendations on the grounds that a less desirable plan is analyzed in detail in the District Engineer's survey-review report. Local interests point out that a plan for flood control and water conservation in Area B, Dade County, involving pumping westward, combined with reasonable land fill to be paid for by local landowners and utilizing available drainage capacity presents the best solution to the problems of Area B. Such a plan will, of necessity, include provision for a minimum water surface elevation between plus 3.0 and plus 3.5 feet mean sea level in the interest of conserving the underground water supply on which Dade County depends for its domestic, agricultural and industrial requirements.

Local interests recognize that a major percentage of benefits from the recommended plan will be in the category of land enhancement. However, the Report emphasizes that important flood control benefits will be produced at the outset and that this category of benefits will even progress through the economic life of the Project.

Local interests recommend the Board of Engineers for Rivers and Harbors return the District Engineer's Report of July 9, 1958, for revision to reflect the desires of local interests as set out in this Report, and that the revised Report of the District Engineer be submitted in time to make it available for consideration by the next session of Congress during hearings on any Omnibus River and Harbor and Flood Control Legislation which may be passed by the 2nd Session, 86th Congress.

INTRODUCTION

Area B, Dade County, is the most logical expansion area for future growth of Metropolitan Miami. Its importance is recognized by all local and state agencies concerned with the Central and Southern Florida Project.

Area B has been an important part of the Central and Southern Florida Project since the overall plan was originally presented to Congress in House Document 643, 80th Congress. Area B must continue as a vitally important part of any flood control project which is responsive to the needs of the Dade County area.

There is presented in this report:

I. A BRIEF HISTORY OF AREA B.

II. A SUMMARY OF LOCAL ACTIVITY, AREA B.

III. COMPARISON WITH OTHER FLOOD CONTROL PROJECTS.

IV. A RECOMMENDED PLAN OF ACTION FOR AREA B.

V. CONCLUSIONS AND RECOMMENDATIONS.

In addition there will be Appendices including Plates.

This report is presented to demonstrate conclusively that the findings, conclusions and recommendations of the District Engineer in his survey-review report of July 9, 1958, are inconsistent with Federal policy in the field of water resource development and unacceptable to local interests. The problems of Area B can be and will be solved within the framework of the authorized Central and Southern Florida Project.

I A BRIEF HISTORY OF AREA B

Area B, an arm of the Everglades basin, originally drained eastward to Biscayne Bay through the Miami River and other small streams which cut through the coastal ridge from Snake Creek on the north to Snapper Creek on the south. The area consists of approximately 235 square miles of poorly drained glades land lying between the coastal ridge and Levees 33, 30 and 31 of the Central and Southern Florida Project. The area situated north of Tamiami Canal is generally below elevation 6 feet. South of Tamiami Canal land elevations rise to a maximum of 10 feet. The lowest lands of the area are centered about the Miami Canal.

During the early years of the development of the City of Miami, Area B experienced flooding almost annually. As the city grew and expanded to cover the high lands of the coastal ridge, public officials and private interests alike became concerned over the need for additional land west of the center of the city useable for the orderly growth and expansion of metropolitan Miami. This was the situation when the flood of 1947 occurred.

In the 12 years since the '47 flood, the phenomenal growth of Miami and its adjoining suburban communities of Dade County has increased the requirements for a large additional area of useable land for the westward expansion of the city.

This situation is not unique to the Miami area. The same situation existed in Broward County west of Fort Lauderdale and in Palm Beach County west of the city of West Palm Beach. In both Broward and Palm Beach Counties existing works of the Central and Southern Florida Project have paved the way for the westward expansion of these coastal communities on lands subject to very frequent flooding prior to the construction of the essential project works.

The establishment of the conservation areas of the Central and Southern Florida Project removed from the area of Broward County, approximately 55 percent of the total county area. The remaining 45 percent is now being intensively developed by the rapid westward expansion of the coastal communities of Broward County. It is expected that the development will ultimately be complete all the way to the conservation area levees. The north half of Dade County has been reduced to about half its original area by the establishment of Conservation Area 3. It is not unreasonable to assume that the lands located east of the conservation area levees should be made available for productive use whether it be agricultural, urban or industrial as a result of the completion of the Central and Southern Florida Project and related secondary works to be provided by local interests. Certainly it has been the belief of local interests that lands located east of the conservation areas would become available for development as the Central and Southern Florida Project progresses.

The need for more room for westward expansion is more acute in the Dade County area than in either of the other two coastal counties.

Today we find the pressure of expansion forcing new developments to reach out into the lower lying lands of Area B at considerable cost over and above the normal cost of development of residential and commercial property in the south Florida area. This expansion into Area B is taking place in spite of the fact that the benefits promised under the Central and Southern Florida Project as described in House Document 643, 80th Congress have not been realized.

Engineers, planners, economists and public officials are in agreement that Area B is needed to permit the orderly expansion of metropolitan Miami to accommodate the expected 1,678,750 residents in Miami by 1980.* Congress also recognized the importance of Area B, Dade County when the Senate Committee on Public Works adopted a resolution on November 15, 1954, instructing the Chief of Engineers to review the report on the Central and Southern Florida Project to determine whether or not modifications of the project were advisable with respect to "Dade County with particular reference to westward expansion requirements of metropolitan Miami between the coastal ridge and the conservation areas".

The report of the District Engineer prepared in compliance with instructions contained in the above mentioned resolution of the Senate Committee on Public Works, is a survey-review report on the Greater Miami Area (Area B) dated July 9, 1958. The District Engineer finds that (1) benefits resulting from drainage of the area would be almost entirely land enhancement; (2) average annual benefits are estimated to be $22,949,800; (3) the degree of Federal interest is negligible since provision of the works considered would, in effect, be providing storm drains and pumping capacity needed for urban expansion and real estate development.

The District Engineer concludes that (1) without additional field exploration and detailed studies, no plan of improvement can be presented which can offer proof against increasing the salt water intrusion threat to the Miami Water supply; (2) that because of the nature of the benefits produced, that is almost entirely land enhancement, there is essentially no Federal interest in the provisions of the plan; (3) the provisions of works needed for urban expansion and real estate development has always been considered the primary responsibility of the municipalities concerned.

The District Engineer finally recommends that the Federal Government not participate in improvement of the drainage facilities in Area B.

*Estimate by University of Miami, Bureau of Business and Economic Research.

The remaining pages of this report will be devoted to summarizing local activities in flood control and water resources development in Area B, sponsored by and financed by local interests, together with a comparison of the Area B problem and the problems of other authorized flood control projects around the country. The report will show that the inclusion of Area B in the Central and Southern Florida Project is consistent with the announced policies of the Congress of the United States, the Bureau of the Budget and the Corps of Engineers. Finally, this report presents a recommended plan of action which will result in the authorization of a plan for the solution of the problems of Area B within the framework of the Central and Southern Florida Project.

II. A SUMMARY OF LOCAL ACTIVITY, AREA B

The residents of south Florida and, more recently, the state of Florida have been striving for years to improve flood control and water resource development of Area B in a manner designed to permit the orderly growth of the City of Miami, westward from the coastal ridge. In the early days of the development of south Florida, work consisted simply in the improvement of the then existing streams which cut through the coastal ridge and carried surplus waters from Area B to Biscayne Bay by gravity. These simple channel improvement works were followed by the well organized efforts of the Everglades Drainage District to improve drainage of surplus waters from the Everglades to tidal waters of Biscayne Bay. The Miami Canal is one of the major works of the Everglades Drainage District.

It was apparent to the residents of Dade County that the works of the Everglades Drainage District would not be adequate to solve the water control problems of Area B. Accordingly the 1945 Florida Legislature authorized, for the first time in the State's history, a county wide drainage district in Dade County. This county wide district was authorized by the legislature in 1945 and has functioned through the years to provide a system of secondary canals needed to augment the drainage capacity of the primary canals provided under the Everglades Drainage District and more recently under the Central and Southern Florida Project to give some degree of relief from flooding to all of the Dade County area. There is presented in tabular form, a summary showing the extent of the secondary system provided by Dade County entirely at the expense of its citizens.

SECONDARY CANALS

Paid for (or to be paid for) by Dade County Interests

Item	County-wide System	Area B only
1. Existing Canals		
Length, Miles	259	117
Value, Excav. (1)	$11,600,000	$ 4,580,000
" R/W (2)	7,250,000	3,270,000
Total Value	18,850,000	7,850,000
2. Proposed Canals		
Length, Miles	197	71
Value, Excav. (1)	8,640,000	2,770,000
" R/W (2)	5,520,000	1,990,000
Total Value	14,160,000	4,760,000
3. Totals		
Length, Miles	456	188
Value, Excav.	20,240,000	7,350,000
" R/W	12,770,000	5,260,000
Grand Total Values	$33,010,000	$12,610,000

Footnotes: (1) At $.50 cubic yard

(2) 115' av. width at $2,000/ac. ($28,000/mi.)

Following the authorization of the Central and Southern Florida Project in the Flood Control Act of June 30, 1948, detailed studies of the major areas of the District were undertaken by the Corps of Engineers and the Central and Southern Florida Flood Control District. In June of 1952, the engineering department of the Flood Control District completed a plan of major facilities for the Greater Miami area to be provided as a part of the Central and Southern Florida Project. This report pointed out the inadequacies of the gravity drainage system for the metropolitan Miami area authorized in the Flood Control Act of June 30, 1948. It suggested the inclusion in the Central and Southern Florida Project of a combined gravity drainage and pumping plan for the relief of flooding in the Greater Miami area. It is a variation of this plan which is discussed by the District Engineer in his survey-review report of July 9, 1958.

Local interests obtained authorization for the Corps of Engineers to make a review investigation of Area B.

The citizens of Dade County have contributed time, effort and money to the various programs designed to solve the flood problems of Area B over the years. In 1953, the Board of County Commissioners of Dade County set standards for flood plain zoning and fill criteria by means of a flood-criteria map, establishing minimum ground and road levels in the unincorporated areas of the county. The first criteria were based on a relatively few canal and ground-water stages with emphasis on the 1947 flood level and 1948 high water. The flood criteria map is included in the Appendix to this report. It is estimated that the system of secondary works constructed entirely at Dade County's expense, represented an investment of $12,610,000. The records of the Central and Southern Florida Flood Control District show that Dade County has contributed $9,092,000 in local taxation to the Flood Control District since its organization in 1949. In addition, the works of the Everglades Drainage District in Area B were donated as a part of the Cooperative Federal-State-Local Central and Southern Florida Project when it was authorized by Congress in 1948 and further modified by additional authorization in 1954. The Dade County secondary plan and fill criteria data will be found in Appendix B.

Local interests in the Central and Southern Florida Flood Control District are vitally interested in the solution of the problems of Area B, Dade County and in the continuation of this area within the authorized project for central and southern Florida.

Pertinent quotations from project documents describing authorized flood control projects around the country are set out below along with appropriate quotations of policy concerning land enhancement benefits.

III. COMPARISON WITH OTHER FLOOD CONTROL PROJECTS

The Central and Southern Florida Project was authorized under the provisions of the Flood Control Act of June 22, 1936, as modified by the Flood Control Act of December 22, 1944. Before any comparisons are drawn between this project and others of the currently authorized program of the Corps of Engineers, it is considered advisable to cite the pertinent provisions of the two above named flood control acts. Section I of the Act of June 22, 1936 includes the basic declaration of policy of the Congress of the United States with relation to the Federal program of flood control. This section is quoted in full below.

> "Declaration of Policy
>
> Section 1 - It is hereby recognized that destructive floods upon the rivers of the United States, upsetting orderly processes and causing loss of life and property, including the erosion of lands, and impairing and obstructing navigation, highways, railroads, and other channels of commerce between the states, constitute a menace to national welfare; that it is the sense of Congress that flood control on navigable waters or their tributaries is a proper activity of the Federal government in cooperation with states, their political subdivision, and localities thereof that investigations and improvements of rivers and other waterways, including watersheds thereof, for flood control purposes are in the interest of the general welfare; that the Federal government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, for flood control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected."

Bearing in mind the above quoted declaration of policy of the Congress there is presented a partial quotation of Section 2 of the Flood Control Act of December 22, 1944, which laid the foundation for the authorization of the Central and Southern Florida Project and similar projects throughout the country.

> "Section 2 - That the words 'flood control' as used in Section 1 of the Act of June 22, 1936, shall be construed to include channel and major drainage improvements, ------."

From the foregoing quotations of the two pertinent acts of Congress, it is obvious that the Central and Southern Florida Project was authorized as a comprehensive program involving major drainage designed to produce benefits of flood protection, water conservation and other purposes. The principal benefits to be produced by the project fall clearly within the definition of 'flood control' as included in the Act of December 22, 1944. As reported to Congress by the Corps of Engineers, it is clear that, "the benefits to whomsoever they may accrue are in excess of the estimated costs."

Land Enhancement Benefits

The Central and Southern Florida Project as described in House Document 643, 80th Congress produces important benefits of land enhancement or increased use of land. In the original study submitted to the Congress in 1948, and printed in House Document 643, 80th Congress, 64.6% of all benefits are reported to be in this category. It is important, therefore, to investigate the policies of the Congress with respect to land enhancement benefits. A study of the reports on various projects involving benefits of this character has developed pertinent information which is set forth in the succeeding paragraphs by projects.

TEXAS CITY AND VICINITY, TEXAS
(H. Doc. 347, 85th Cong. 2nd Session)

This report described a local protection project for Texas City and vicinity and includes the following statement. "Enhancement in land values - Development of the low areas along the north side of Texas City is relatively small because of the low ground elevation and the frequency of flooding. Protection of the unimproved land by the features of the plan of improvement would permit use of this land for residential development. The land would increase in value. The enhancement in land values as estimated in Appendix 1 and reduced to an annual value, amounts to $448,000." Total annual benefits are cited as $1,453,000, of which $1,005,000 is prevention of storm damage and $448,000 enhancement in land value. Approximately 31% of total benefits are attributable to land enhancement.

Paragraph 74 of the report includes the statement that the requirements of local cooperation conform to the present Federal policy for local cooperation on local protection projects. The usual requirements are cited with the additional requirement that local interest shall be required to contribute in cash or in items of construction on the Federal project of equal value, a total sum equal to 16% of the construction cost of the plan of improvement.

A very pertinent statement concerning apportionment of costs among the various interests is included in paragraph 76. The paragraph reads as follows: "The apportionment of first costs of the proposed improvement is based on the present Federal policy for apportionment of cost of local flood protection projects. This policy provides that in projects involving substantial land enhancement benefits non-federal interests shall contribute not less than 50% of the share of the first cost attributable to such benefits. A considerable portion of the benefits from the proposed improvement would be from enhancement in value of the land protected. The share of the first cost attributable to storm damage prevention is apportioned to the Federal government. The local share would include the cost of rights of way and relocations and a cash contribution of the balance of the local cost."

GREEN AND DUWAMISH RIVERS
and
DUWAMISH WATERWAY, SEATTLE HARBOR, WASHINGTON
(H. Doc. 271, 81st Cong. 1st Session)

This report describes a project involving the construction of a reservoir and certain channel improvement works on the Green and Duwamish Rivers, Washington.

In paragraph 77 of the report, project cost is estimated at 18.3 million dollars. It is suggested in the report that local interest bear 2 million dollars of the first cost of the improvement. This local share of cost amounts to approximately 11% of the first cost of the improvement.

Paragraph 79 of the report discusses benefits of the flood control plan and reads in part as follows, "Benefits to be realized from the project include prevention of flood damages, increased crop returns from change in land use resulting from removal of the flood threat, prevention of loss of fish life, provision of storage for water supply and irrigation, and aid in industrial expansion."

Paragraph 81 of the report discusses increased returns from change in land use in the following quotation, "If the lands in the Green River Valley were freed from the threat of recurrent flooding, it is probable that they would be converted at a rapid rate from their present use to the production of higher-value crops and to sites for industrial plants." A comparison is made between land values in this valley and the neighboring protected Puyallup Valley with this statement, "Land values in the Puyallup Valley are generally about 165% of those in the Green River Valley".

The report continues in paragraph 82 with a statement that the land enhancement benefit attributable to increased crop production is estimated at $214,000 annually. Another category of land enhancement values is discussed with respect to those lands to be converted to industrial use. This annual benefit of land enhancement is an additional amount of $191,000.

In paragraph 87 of the report under local cooperation, the following language appears, "Of the total estimated annual benefits of $893,000, a substantial portion, or $405,000, is for increased return from protected land. This increased return is considered to be a direct benefit to present owners of the land and is believed sufficiently important to warrant consideration of a substantial local contribution toward the first cost of the project. The matter of local contribution has been discussed with local interests and assurances have been received from the Department of Conservation and Development of the State of Washington that, subject to legislative approval, it will participate in the cost of the project in the sum of $2,000,000. This is considered the minimum contribution from local interests that will fulfill the requirements of local cooperation." In other words, with 45% of the benefits attributable to land enhancement, local interests are requested to furnish 11% of project cost.

LOS ANGELES AND SAN GABRIEL RIVERS
and
THEIR TRIBUTARIES, AND BALLONA CREEK, CALIFORNIA
(H. Doc. 838, 76th Cong., 3rd Session)

In this report land enhancement is discussed in paragraph 105 under Incidental Benefits with the following statement, "In addition to damages to future additional improvements due to normal growth of the flooded area, it is recognized that flood control will permit a higher use of some of the lands. However, no separate estimate has been made of this incidental benefit for the areas on which direct and indirect flood damages have been estimated."

The report continues in paragraph 106 with the following statement, "It was seen that, in a majority of the flood areas under consideration, it would be possible for the floods to take other paths than the one considered most probable. Direct and indirect damages, however, were estimated for only one path, but it was recognized that the removal of the flood menace to these alternate paths would be a benefit. It is believed that the removal of the flood menace from these alternate paths will be reflected in a permanent increase in their values, and therefore, the annual benefits from this source were estimated at 5% of the estimated increase in value. The total benefits from the removal of the menace to these alternate paths by the construction of the items recommended in the general plan have been estimated as $38,165,000, which at 5% per annum, has an annual value of $1,908,000." From the foregoing it is apparent that land enhancement benefits form an important part of the justification for the Los Angeles County project.

LOWER MISSISSIPPI RIVER - AREA ENCLOSED BY WHITE RIVER BACKWATER LEVEE SYSTEM, ARKANSAS
(Senate Doc. 26, 85th Cong. 1st Session)

This report describes a project involving the construction by the United States of a pumping plant at the Little Island Bayou outlet structure at an estimated cost of $2,380,000, for construction and $57,000 annually for maintenance. In paragraph 31, the report makes this statement concerning annual benefits, "Average annual benefits that will result from the plan of improvement are estimated at $513,800 based on winter of 1955-56 prices. These benefits are attributed to (1) flood damages prevented on about 20,700 acres of cropland between elevations 150 and 154.8 amounting to $182,400 annually and (2) increased land use amounting to $331,400. The latter benefit is dependent upon the construction of 50% of the local drainage improvements proposed by the White River Drainage District and the United States Department of Agriculture on about 48,900 acres of existing cropland and 21,865 acres of woodland which would be cleared and placed in cultivation. The ratio of annual benefits to annual costs is 2.3." Paragraph 32 of the report discusses the requirements of local cooperation. Attention is invited to the fact that no cash contribution to this project with an annual benefit of $331,000 attributable to increased land use is recommended. The omission of a cash contribution is explained in the following statement in the report. "Since the project being studied is a minor modification of the White River backwater levee project for which the extent of local cooperation has already been established by law, no further non-federal participation other than stated in the foregoing paragraphs appears to be necessary or desirable."

This report indicates clearly that land enhancement benefits have been and are being used to justify projects authorized as a part of the over-all project for the Lower Mississippi River Valley.

BOEUF AND TENSAS RIVERS AND BAYOU MACON ARKANSAS AND LOUISIANA
(H. Doc. 108, 85th Cong.)

The project plan provides for minor extension to an existing project by extending certain canals for the purpose of producing benefits of reduction of flood damage and increased land use. The estimated cost of canal extension is $1,212,000. In this report, the cost of local farm drainage improvements to supplement main channel work is included in estimated project cost as a non-federal expenditure and totals $828,000. The total project cost is shown as $2,040,000, total annual benefits cited are $576,100 of which $554,500, or 96% is land enhancement or increased land use.

This project was authorized in the Rivers and Harbors and Flood Control Act of 1958. A significant statement is contained in the Senate report on this act (Report No. 1710, 85th Congress, 2nd Session). On page 85, the following remark appears, "The committee notes the large amount of local costs for laterals and farm drains to make the project effective, and realizes that additional large expenditures will be necessary for clearing and developing the land and for related costs. Requirements for local cooperation appear adequate and the committee recommends authorization of the project as recommended by the Chief of Engineers without cost sharing with the understanding that present policies applicable to the lower Mississippi Valley project would be maintained."

SAGINAW RIVER, MICHIGAN
(H. Doc. 346, 84th Cong.)

This report describes a local-protection series of local protection projects and major drainage improvements in the basin of the Saginaw River at eight separate locations. Total estimated cost is $20,404,900 of which $16,085,000 is Federal and $4,319,900 is local. Local interests are required to bear approximately 27% of the total project cost. An analysis of benefits reveals, however, that 63% of estimated annual benefits are attributable to land enhancement of increased land use.

The report has been transmitted to Congress with the approval of the Bureau of the Budget and was authorized in the Flood Control Act of 1958. A strict adherence to the policies set forth in Budget Circular A47 would require that local interests contribute 31 1/2% of total project cost by virtue of the large amount of land enhancement benefits produced by the Project works.

SALINE RIVER AND TRIBUTARIES, ILLINOIS
(H. Doc. 316, 84th Cong.)

A project providing for channel clearing and channel enlargement on the Saline River and tributaries, estimated cost $6,618,000. The project as described is estimated to produce annual benefits of $386,600, of which 33% are attributable to land enhancement. The report recommends that local interests contribute 16 1/2% of total project cost and this recommendation is approved by the Bureau of the Budget. The project was authorized in the Flood Control Act of 1958.

MISSISSIPPI RIVER IN THE VICINITY OF PRAIRIE DU ROCHER, ILL.
(H. Doc. 222, 80th Cong., 1st Session)

This report describes a flood control project designed to protect approximately 16,000 acres of land subject to periodic flooding against a 50 year flood on the Mississippi River. The report states that protection would be provided to approximately 11,400 acres of high quality agricultural land now subjected to periodic flooding and for approximately 4,600 acres of other land, much of which is susceptible of cultivation or higher land use after protection. Of the total annual benefits cited, amounting to $225,700.00, $116,500,000 or 51% is in the category of land enhancement. The project is estimated to cost $2,575,000 and local interests are required to provide land, easements and rights of way, hold and save the United States free from damages, and maintain and operate the works after completion. No cash contribution to construction is required under this project.

REQUIREMENTS OF BUREAU OF THE BUDGET, CIRCULAR A-47

The original A-47 circular was released to the executive agencies by the Bureau of the Budget on December 31, 1953. The definition of land enhancement benefits is set forth in Section 8 "Benefits to be included in evaluation", of Circular A-47 and reads as follows:

> "b. Increases in the expected net income obtained directly from changed use of the property made possible by any form of flood control."
>
> "d. Increase in expected net farm income from additional production or reduced cost of production of farm products as a result of reclamation of land."

The two sub-paragraphs quoted above describe categories of primary benefits which are classed as land enhancement under the provisions of Circular A-47, Section 17, paragraph (c) reads as follows:

> "Where benefits of the type described in paragraph 8 (b) of this circular are attributed to a local flood control project, the project report will be reviewed in accordance with the criteria that there shall be a payment or contribution toward the construction costs of the project equal to at least 50 percent of an amount determined by applying to the total construction costs of the project, the ratio of the particular land enhancement benefits involved to total monetary primary benefits as estimated in the evaluation report. To the extent feasible a payment or contribution toward the costs of the program or project shall also be made where benefits of the type described in paragraph 8 (b) of this circular are attributed to other flood control or flood prevention programs or projects in determining a payment or contribution that should be required in these cases. The responsible agency should consider the value of benefits to local beneficiaries. The evaluation report shall explain how the portion of the cost to be borne by local beneficiaries was determined."

A study of Bureau of the Budget Circular A-47 leads to the conclusion that land enhancement benefits are classed as primary benefits of federal flood control projects. It is also clearly stated that any increase in net income obtained from the changed use of the property is classed as land enhancement. The Budget circular presents a formula for the computation of cost sharing arrangements in flood control projects where land enhancement benefits are involved.

The various project documents cited in this section of the report contain statements of policy by the Corps of Engineers dealing with the subject of land enhancement and allocation of cost in numerous projects. These policy statements have been approved by the Bureau of the Budget at the time reports were transmitted to the Congress. Finally, the policy pronouncements of the executive branch have been approved by the Congress when the various projects were authorized in river and harbor and flood control acts from time to time.

Nowhere in the large volume of reference material studied prior to the preparation of this report, was any policy statement found which would justify the recommendation of the District Engineer to eliminate Area B, Dade County from the Central and Southern Florida Project on the grounds that the benefits were almost entirely land enhancement. It appears, therefore, that the recommendations of the District Engineer in the survey-review report of Area B are contrary to existing federal policy as it pertains to flood control projects involving land enhancement benefits.

IV. A RECOMMENDED PLAN OF ACTION

A. General

The District Engineer's report of July 9, 1958, concurred in by the Division Engineer, concluded that:

1. Without additional field exploration and detailed studies, no plan of improvement for Area B can be presented which can offer proof against increasing the salt water intrusion threat to the Miami water supply, and;

2. From review of the nature of the benefits which would result from the provision of adequate drainage for Area B, that there is essentially no Federal interest in provision of the plan.

As a result of these conclusions, the District Engineer recommended that the Federal Government not participate in improvement of the drainage facilities in Area B.

These conclusions are based on what the Central and Southern Florida Flood Control District and the government of Metropolitan Dade County submit are two erroneous assumptions of fact. These are:

1. That it is necessary to provide a water control elevation of 0.0 feet above mean sea level in order to have an adequate plan which will provide benefits for Area B; and

2. That the only benefits which will obtain from the implementation of an adequate plan for Area B will be urban land enhancement benefits.

In the following paragraphs the District and the Dade County Metropolitan government will present an alternative, feasible engineering plan which takes full cognizance of:

1. The inter-relationship of Area B with the areas served by the presently authorized project and the areas covered by planning reports already authorized by the Congress of the United States;

2. The need for the logical and orderly development of Area B as an integrated phase of the development of Metropolitan Dade County;

3. The responsibility for the protection of the Miami water supply; and

4. The requirement that the individual landowner bear a reasonable share of the cost of development of Area B, in accordance with criteria established by Dade County on a county-wide basis.

Further, it will be shown that a portion of the benefits to be derived from the implementation of this alternative plan, or any plan, will be flood damage prevention benefits.

B. Area B in Relation to the Authorized Project and Metropolitan Dade County

1. Introduction:

Basic to the consideration of a practicable and feasible engineering plan for water and flood control in Area B is recognition of the fact that this area is an integral part of the entire Central and Southern Florida Flood Control Project area. With recognition of this fact must come the realization that the planning for this area must take into account the planning and construction already underway under the Central and Southern Florida Flood Control Project in the entire project area in general and in Dade and Broward Counties in particular. Area B is not a unit which is separable, either geographically, economically, geologically or hydrologically, from the entire South Florida complex.

Area B, containing 235 square miles, is bounded on the east by the foot of the coastal ridge and on the west by Levees L-30, L-33 and L-31. To the north it extends to the north divide, in Broward County, of Canal C-9 and to the south it is bounded by the north divide of the Canal C-1 watershed. The areas to the north, east and south of Area B are, or will be, served by flood and water control facilities to be provided under the existing authorized project. To the west of Area B north of Tamiami Trail is Project Conservation Area 3; south of the Trail is an area between Levee L-31 and the Everglades National Park for which a survey-review report has been authorized.

Area B is an area which by geographic, economic and hydrologic ties is bound inseparably to the expanding metropolitan area of southeast Florida and to the planned portion of the Central and Southern Florida Flood Control Project.

By reference to the map following the title page of this Report the geographical location of Area B in relation to the Dade County metropolitan area and the planned portion of the existing project can be seen. It will be the purpose of the following paragraphs to indicate the nature and extent of the hydrologic and economic ties between this area and the remainder of the Dade County metropolitan complex.

2. Hydrology

A complete description of Area B, and the hydrology of Dade County, is given in the report of the District Engineer on Area B and in several previous reports on the Dade County phases of work planned for the Central and Southern Florida Flood Control Project.

Briefly, Area B is saucer shaped in its configuration. The land surface elevations in the northerly two-thirds of Area B are low, ranging from less than 4.0' msl. to about 6.0' msl.; the greater portion being between 4.0' msl. and 5.0' msl. South of Tamiami Trail, land elevations rise, ranging from 6.0' to 10.0'. Under natural conditions the area was largely flooded most of the time, being in effect a lake or lagoon with no outlet except the porous underlying rock.

That portion of Area B north of Tamiami Trail is a part of the Everglades Basin and the soils are generally peat and muck of varying depths underlain by limestone or sandstone. Depths of these organic soils range from a few inches to about 6 feet. South of Tamiami Trail the depth of organic soils is insignificant. Top soils are generally sands and marls.

Partial drainage of this area was afforded by the excavation of canals through the coastal ridge during the 1920's. The enlargement of these coastal canals, which for the major portion of their lengths are in the area east of the coastal ridge (Area A), was a part of the planned improvement for flood control purposes in Dade County under the existing project, authorized in 1948.

The possibility of enlarging these canals to the extent necessary to provide gravity drainage for Area B was considered both by the Jacksonville District Engineer and the Flood Control District. However, the metropolitan area east of the coastal ridge had become so congested that this scheme was found to be impracticable of implementation.

The canals of Area A, therefore, as designed to handle design storm runoff from that area and as planned and constructed under existing authorization, can handle only a severely restricted discharge from

Area B. As increased residential and industrial development takes place in Area B, increasing the rate of runoff and creating the demand to remove that runoff, an undue burden will be placed on the capacities of the Area A canals if other means of runoff removal are not provided. The net effect of not providing alternative means of flood runoff removal would be to reduce the predicted benefits to Area A resulting from the enlargement of Area A canals under existing project authorization.

This is already happening in the Snapper Creek Canal (C-2) watershed. This canal improvement was largely installed by local interests, by means of free digging contracts, with capacity considerably in excess of the project design capacity. Even so, urban and other type development in the southwest portion of Area B has increased runoff to Snapper Creek Canal to the extent that its installed capacity will soon be exceeded and its Area A benefits reduced.

Here, therefore, is the first instance of the inter-connection, hydrologically speaking, of the planned works of the authorized project and the question of adequate water and flood control for Area B.

On the west edge of Area B, north of Tamiami Trail, Levee L-30, the east perimeter levee of Conservation Area #3 of the existing authorized project, has been constructed. Inseepage into Area B from Conservation Area #3 contributes to the problem of water level control in Area B. Consideration must be given to the effect of the planned works of Conservation Area #3, and the proposed schedule of water stage regulation for that area, on the hydrologic regimen to be imposed on Area B by those works and regulation schedules.

South of Tamiami Trail, Area B is bounded by Levee L-31 of the authorized project. Authority to initiate investigations into the feasibility of providing water and flood control facilities for the lands west of L-31 and east of the Everglades National Park boundary has been granted by the Congress. Here, again, the effect of planning for these facilities must be recognized in considering Area B, and vice versa.

Finally, to the south of Area B is the watershed of Black Creek Canal, Canal C-1 of the authorized Project. And, further south are the major water and flood control facilities even now being investigated, and studied in detail, in connection with the authorized survey-review report for south Dade County. In terms of a possible source of water supply alone, Area B must be considered as an integral part of the South Dade system as well as a part of the system for supplying water to the Everglades National Park to the west.

The foregoing is presented to give some indication of the high degree of inter-connection of Area B, hydrologically, with the South Florida areas served by the authorized Project and with those other areas for which studies of survey-review scope have been authorized. These works, already in existence or planned, have, and will have, a great influence on the hydrology of Area B. Conversely, such water and flood control facilities as are installed to meet the problems of Area B, will have an effect on other areas of South Florida already served by the authorized Project. It is wise planning to insure that such geographically integrated areas are served by an integrated plan for water and flood control which will provide the maximum protection and benefits for the entire area.

It is intolerable to consider that Area B, which is not only entirely within the Project area, but which is surrounded on all sides by already authorized works, might develop in such manner as to reduce benefits accruing to the construction of those works; in effect, negating the work accomplished under the authorized project. However, the alternative would be equally intolerable, to impose such restrictions on the use of the authorized works as would stifle the use of Area B as the logical area for the westward, concentric expansion of Metropolitan Miami.

3. Land Use

This section includes material which will indicate the manner in which Area B is economically integrated with the Metropolitan Dade County complex and which will indicate further, that expansion will take place into Area B as a result of natural and logical population and industrial growth without regard to the existence, or non-existence, of a flood and water control project for the area.

Area B has very little in the way of natural resources or population supporting economic base and if it were an isolated location it would not be logical to assume that any rapid rate of growth could be expected. However, a study of the map will indicate its geographical relationship to Metropolitan Miami. Metropolitan Miami and Dade and Broward Counties are dependent upon Area B for rock for construction purposes and to a lesser degree as an agricultural hinterland but the major need is land for the industrial and residential expansion which is sure to come. Area B is economically dependent upon Miami as an expanding market for rock, agricultural products and the labor of its present and future residents.

Since Area B is on the fringe of solid urban growth of the Dade County Metropolitan area and the Board of Engineers for Rivers and Harbors estimates that the population of Dade County will be 5,513,000 people by the year 2010, it is only logical to assume that a sizeable portion of this population increase will occur in Area B. The eastern portion of Area B has been under development for several years, particularly south of Tamiami Trail in the Snapper Creek area. This has resulted from the increasing population pressure of the past decade in the Metropolitan Miami area and is representative of the gradual expansion westward of residential and industrial development into lands which can be made suitable for such use by adequate filling; particularly after major arterial flood water removal facilities are provided.

This expansion is typical of the normal growth pattern of metropolitan areas which tend to expand, generally, concentrically about the central area. Local conditions, of course, will cause modifications to this typical pattern. In the case of the Metropolitan Miami area the bulk of the expansion will be westerly into Area B and southerly into South Dade County.

Due to the rapid population increase, with resultant pressures on available lands for residential and industrial use in Dade and Broward Counties, which all population analysts recognize, and the shortage of high land available in these counties, it is a certainty that a great amount of urban development will take place in Area B with or without a Federal project. It is further felt that a flood control project in Area B would speed urban development but not result in any great increase in total urban development by the year 2010. On the other hand, agricultural use would be considerably increased as long as there was sufficient space.

The findings resulting from detailed studies of present and prospective land use in Dade County as a whole, and in Area B specifically, are presented in Appendix A of this report.

C. Engineering Plan for Area B

1. Introduction:

The District Engineer's report on Area B did not make any recommendation as to a plan for Area B. Three alternative plans were discussed, however, and one of them (Plan II) was given more detailed treatment in Appendix A of his report. The three alternate plans, as presented in the District Engineer's report are:

I. Drainage by gravity to Biscayne Bay.

II. Drainage by canals and pumps to Conservation Area No. 3; water control elevation 0.0.

III. Drainage by canals and pumps to Conservation Area No. 3 combined with land fill; water control elevation 3.0.

A. Immediate development.

B. Phased development.

Plan I was not considered practicable of accomplishment. In this the Flood Control District and Dade County concur. Preliminary studies made by the District Engineer, and extended discussions with his staff, indicated the preferences of the District Engineer for Plan II, the plan detailed to some degree in the survey-review report. However, the District Engineer's report does not clearly present any particular reason for the preference of this plan over the combination pump-fill plan.

Nevertheless, this is the plan which, because of the extremely low water control elevation recommended, is the basis for the District Engineer's conclusion that the installation of water and flood control facilities for Area B may have heavy adverse effects of the Miami water supply. And elsewhere in the report it is stated that, in order to resolve these questions of adverse effects on water supply, long and detailed studies costing one million dollars would probably be required!

It appears to the Central and Southern Florida Flood Control District and the Dade County Metropolitan government that a perfectly feasible plan of development is available which will not have adverse effects on Miami's water supply. The following sections will detail this alternative plan.

2. General

The plan for flood control in Area B proposed herein by the Flood Control District and Dade County is essentially Plan III of the survey-review report, modified to reflect the effect of borrow pit storage and reduction of inseepage by construction of an internal levee in Conservation Area No. 3, to make lower stages possible west of Levee L-30.

Past urban and industrial developers in South Florida requiring land fill have nearly all found it economically necessary to obtain the fill materially from within, or very near, the area being developed. This will take place in Area B and, together with primary and secondary canals, will provide important flood storage capacity, thus reducing maximum discharge requirements.

The internal levee across Conservation Area No. 3 north of the extremely permeable rock formation along Levee L-30 is a desirable, perhaps a necessary, addition to the project regardless of Area B and its problems. It is under consideration now by the Jacksonville District Engineer and the Flood Control District.

3. Control Stage

The water level control stage in Area B should be such that the danger of salt water intrusion will, with certainty, not be increased. Land fill requirements should be based upon that safe control stage.

For the purpose of this preliminary presentation, that safe level had been set at 3.5 ft. above mean sea level. This probably can be reduced to 3.0 ft. msl.

4. Fill Requirements

A depth of 2.5 feet to the ground water table is about minimum for urban and industrial development in South Florida, therefore the probable fill elevation has been taken as 6.0 ft. msl. Many developers and industries will fill to somewhat higher elevations.

5. Flood Stage

Design flood stage has been set at 3.0 ft. msl. at the pump stations and 6.0 ft. at the highest point, near the Area A boundary. Detailed study and routings of Areas A and B flood waters may indicate slightly different flood profiles.

6. Flood Water Storage

Temporary flood storage will be provided in the borrow pits, canals, and the ground, between the control stage and flood stage, and in the swales and third order drainage facilities. Allowance for swale storage conforms to FHA requirements in Dade County.

Storage depth in the borrow pits and canals will average about 2.0 feet, equivalent to 3.6 inches over the entire area.

Swales conforming to FHA requirements provide about 1.0 inch of detention storage and another 0.5 inch has been assumed for third order drainage facilities.

Underground storage, averaging about 1.5 feet in depth, provides another 2.5 inches of storage capacity.

7. Potential Developed Area

With the proposed project in operation all of the 235 square miles in Area B will be available for development except that portion used for borrow pits and canals. The total area required for that use is estimated to be 37 square miles, based upon a minimum ground elevation of 6.0 ft. msl., averaging borrow pit and canal depth of 10.0 ft. and 40 percent reduction in volume of organic soils by compaction and oxidation. Organic soils below the water control level will not be subject to oxidation and that above control level or under building areas will be used in the preparation of topsoil for yards, therefore, the principal loss will be compaction.

Therefore, 198 square miles (127,000 acres) will be subject to development eventually to urban and industrial use, but in the interim period, partly into high value agricultural use.

8. The Design Flood

Protection of urban and industrial development with fill to 6.0 ft. msl., against flood damage during a 24-hour storm of once in 25-years frequency is considered entirely adequate for the area. This storm is equivalent to 11.0 inches of rainfall in 24 hours.

Total flood storage capacity as detailed above will be; 3.6 inches in borrow pits and canals, 2.5 inches ground storage, 1.5 inches in swales, and third order drainage facilities, or a total of 7.6 inches.

The runoff required to be removed to prevent all flood damage from the design storm will then be 11.0 inches minus 7.6 inches or 3.4 inches in 24 hours.

9. Seepage

Construction of the internal levees in Conservation Area No. 3 will result in a maximum stage west of L-30 of about 8.0 ft. msl., or less. The amount of seepage to be disposed of from Area B will then be 8500 cfs., according to studies made by the Jacksonville District Engineer, the results of which are presented in Design Memorandum, Part V Supplement 12 and in other reports.

10. Design Capacities

The total discharge capacity required is 21,500 cfs. for flood water plus 8500 cfs. seepage from Conservation Area No. 3 or a total of 30,000 cfs.

Capacity for gravity discharge eastwardly can not be accurately determined at this time since the potential design capacity for all the canals has not been determined. The Flood Control District previously has estimated future capacity in the Area A canals to discharge from Area B would be about 4000 cfs. during the first 24 hours. The Corps of Engineers in DPR Part V Supplement 4 estimated a somewhat higher capacity under Standard Project Flood conditions.

For the purposes of this study it was assumed that at least 4000 cfs. capacity would be provided in the six major canals of Area A; Canals C-2, C-4, C-6, C-7, C-8, and C-9.

Thus the pump capacity requirement will be 30,000 minus 4000 or 26,000 cfs.

The District Engineer's studies have indicated that, based upon economics and efficiency, four pump stations should be installed. The drainage areas were determined to be 44.7, 36.9, 56.5 and 96.9 square miles, which, under the plan proposed herein would require pumping capacities of 4600 cfs., 4700 cfs., 5900 cfs., and 10,800 cfs.

11. Costs

The costs shown in the following table are of course preliminary in nature and based largely upon costs of similar project items already installed.

Item	Quantity	Total Cost $1,000,000	Annual Cost $1,000,000
Pump Station	1	2.7	
Pump Station	1	2.7	
Pump Station	1	3.4	
Pump Station	1	6.4	
Project Canals	3 Million Cu. Yds.	1.0 (Spoil sold for fill)	
Right of way	500 acres	0.5	
Other Costs	20%	3.2	
Total Initial		19.9	0.70
Operation & Maintenance			0.70
			1.40

D. Analysis of Benefits & Costs

1. Benefits:

Sub-section B of Section IV of this report indicated that there would be a substantial development of Area B without the considered project, (based on the predicted magnitude of population pressure). The magnitude of these population pressures was admitted, and substantiated, in the District Engineer's report.

However, the report of the District Engineer failed to consider whether or not these pressures were sufficient to force the development of Area B for industrial and residential use regardless of the existence or non-existence of a Federal project for the area. In the light of recent studies it is considered appropriate to question the validity of any benefit determinations for Area B if "development without the project" is not adequately considered.

It is understood, and the multitude of Design Memoranda prepared by the District Engineer for the Central and Southern Florida Flood Control Project will bear this out, that the category into which project benefits will fall is based on the average development of the area under consideration, during the assumed economic life of the project. Using this criterion previous reports on the authorized project have cited flood control benefits to parcels of undeveloped land which would become developed during the average life of the project, regardless of the existence or non-existence of a project for the area.

An examination of the unfavorable survey-review report for Area B shows no such criterion having been used. On the contrary, flood damage prevention benefits are described as being 'insignificant' in a two-sentence paragraph on Page B-1 of the report.

It is believed that the findings presented herein with regard to development of Area B "without the project" are based on fact. Certain of this development, industrial and urban, is even now taking place. It is also further believed that these developments will be subject to flood damage since the Dade County fill criteria will be inadequate to protect them from flooding resulting from major storms, such as the Standard Project storm. After a large percentage of the ultimate development has taken place there will be little protection even against minor floods.

As urban and industrial development progresses into Area B, without provision of firm discharge capacity, the areas available for flood water storage would decrease and depth of storage would increase. Seepage from Conservation Area No. 3 would be about equivalent to the capacity of Area A canals to discharge from Area B.

During the wet season rainfall on Area B would be dependent for dissipation upon seepage and evaporation which would be inadequate to dispose of normal rainfall. Therefore, frequent flooding would again occur in areas presumably protected by the County fill requirements.

Preliminary estimates made for the purpose of this joint report indicate that should urban development in Area B proceed at the predicted rate, without provision of firm discharge capacity, to 75% of its potential, occurrence of a once in 50-years flood would cause $90,000,000 worth of damage, the 25-year flood $80,000,000 damage and even the 2-years flood $10,000,000 damage. Whatever discharge might occur through the Area A canals would simply transfer a part of the damage to that area.

It is believed that the benefit analysis in the survey-review report for Area B has not been treated in the same manner as have been the analyses presented in reports on the works of the authorized Project in that no cognizance has been taken of 'development without the project". This fact alone, is sufficient to warrant the return of this report to the Jacksonville Engineer for:

1. A review of these findings with regard to "development without the project", or for an alternative independent finding with regard to this development;

2. Preparation of a map showing "development without the project" and a determination of damages sustained by these developed areas resulting from floods of various intensities;

3. Preparation of a flood damage-frequency curve for Area B; and

4. A determination of annual flood damages prevented based on items 1, 2 and 3 above.

2. Costs:

The District Engineer's report does not present a detailed analysis of the costs of a plan for Area B because, in fact, no specific plan is recommended. However, a more detailed treatment is given to Plan II, as was mentioned earlier in this report.

No specific reason was set forth for the selection of Plan II for detailed treatment in the survey-review report. However, it is known that in preliminary studies Plan II was considered as the "recommended plan" by the District Engineer and that the basis of this selection was

lowest overall cost; that is $122,000,000, for Plan II ("recommended plan") as against $212,000,000 for Plan IIIB (the most feasible combination pump-fill plan).

The inclusion of local development costs (in this instance secondary canals and land fill) in the survey-review report as a part of the total initial cost is contrary to previous practice. In the analysis of many Design Memoranda by the staff of the Flood Control District no other report has been found where this practice is followed.

If initial cost is to be used as the criterion for the selection of a recommended plan, consistency demands that local development cost be excluded. The comparison of initial costs should be based on project costs only, excluding costs to the individual landowner. Comparing costs on any other basis presents an unfair picture to the Federal and State taxpayer.

The exclusion of the costs to the landowners from consideration in the analysis of initial costs has an additional validity. An earlier section of this report details the fill criteria, a form of flood plain zoning, which have been put into effect by the government of Dade County. These are criteria which apply to all of Dade County, including Area B. These fill costs, as well as the costs of furnishing tertiary, and in some cases secondary, drainage, are costs which the individual landowner and developer expects to bear. The selection of a plan, such as Plan II, which would not take cognizance of this accepted requirement to place a large share of the cost on the developer is both unfair to the Federal and local governments and to developers of residential and industrial properties elsewhere in Dade County. Moreover, a plan, such as Plan II, which removes the burden of paying a major share of the cost from the developer and places that additional cost on the Federal, State and District taxpayer is unacceptable to both the District and Dade County.

Therefore it is evident that on the one hand the survey-review report finds that all benefits from a plan for Area B are urban land enhancement while on the other hand a "recommended plan" is suggested which practically eliminates all costs to those who are to receive the land enhancement benefits and places those costs on the general Federal, State and District taxpayer.

It is felt that a complete review of project costs by the District Engineer, with specific attention to the inequities inherent in the use of Plan II, is in order.

E. Summary

The findings of the Central and Southern Florida Flood Control District and the Dade County Metropolitan government, as detailed in Section IV of this report, can be summarized as follows:

1. Area B is an integral part of the hydrologic complex of South Florida;

2. There is a vital inter-relation between Area B and the authorized and planned works of the Central and Southern Florida Flood Control Project;

3. Area B is the natural and logical westward expansion area for Metropolitan Miami;

4. Residential and industrial expansion into Area B will take place with or without construction of major water and flood control facilities serving that area;

5. An engineering plan, combining westward pumping and land fill, can be developed which:

   (a) Will be economically feasible;

   (b) Will be a plan practicable of accomplishment;

   (c) Will not jeopardize the Miami water supply; and

   (d) Will be integrated with authorized and proposed water and flood control facilities in the Central and Southern Florida Flood Control Project.

6. The costs of the facilities to be installed under such plan are reasonable and in line with costs for providing a similar degree of protection elsewhere in the project area;

7. Such a plan would recognize the responsibility and obligation of the individual landowner to bear all reasonable development costs; and

8. A portion of the benefits attributable to such a plan would be flood damage prevention benefits.

F. Conclusions and Recommendations

1. Conclusions:

Based on the findings presented in the preceding paragraphs it is concluded by the Central and Southern Florida Flood Control District and the Dade County Metropolitan government that the findings of the survey-review report are incorrect with regard to:

a. The feasibility and practicability of a workable engineering plan for major facilities for flood and water control in Area B, and

b. The nature of the benefits which would accrue from the implementation of a plan for major facilities for flood and water control in Area B.

2. Recommendations:

A. That a plan for major flood and water control facilities for Area B, along the lines presented herein, be developed; and

B. That Federal participation in such plan be authorized in order that construction can be undertaken at the earliest practicable date.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

I. A detailed study of a large number of flood control projects involving benefits of land enhancement reveals no basis in Federal policy on water resource projects for excluding Area B from the authorized Project simply because benefits are predominately land enhancement.

II. The District Engineer's report of July 9, 1958, a survey-review report on the greater Miami Area (Area B), selects a less

desirable plan and uses it as a basis for rejecting all consideration of Area B by the Corps of Engineers and the Federal government.

A more desirable plan essentially, alternate III of the District Engineer's report is ignored in the economic analysis and consequently its advantages and disadvantages are not adequately presented in the survey-review report.

III. The Flood Control District and Dade County have developed information which leads inescapably to the conclusion that a variation of Plan III of the survey-review report can be developed which will cost much less than is indicated in the District Engineer's report.

IV. Any plan for Area B must of necessity include provision for a subdividing levee in Conservation Area No. 3 designed to isolate the porous rock formation of the southeast corner and to assist in routing major floods through the Conservation Area spillways southward into the Everglades National Park.

V. The Flood Control District and Dade County conclude that a safe water level control stage in Area B is between plus 3.0 and plus 3.5 feet msl. Such a planned minimum stage will insure the adequacy of the underground fresh water supply for Dade County's domestic, agricultural, and industrial water supply requirements.

VI. It is concluded that filling to plus 6.0 feet msl. combined with pumping of flood waters to the west will provide protection against a design rainfall of 25 years frequency with Project works estimated to cost $19.9 million and having a total annual cost of $1.4 million.

VII. It is concluded that a portion of the benefits to any plan of flood control and water conservation in Area B will be flood damage prevented benefits.

Recommendations

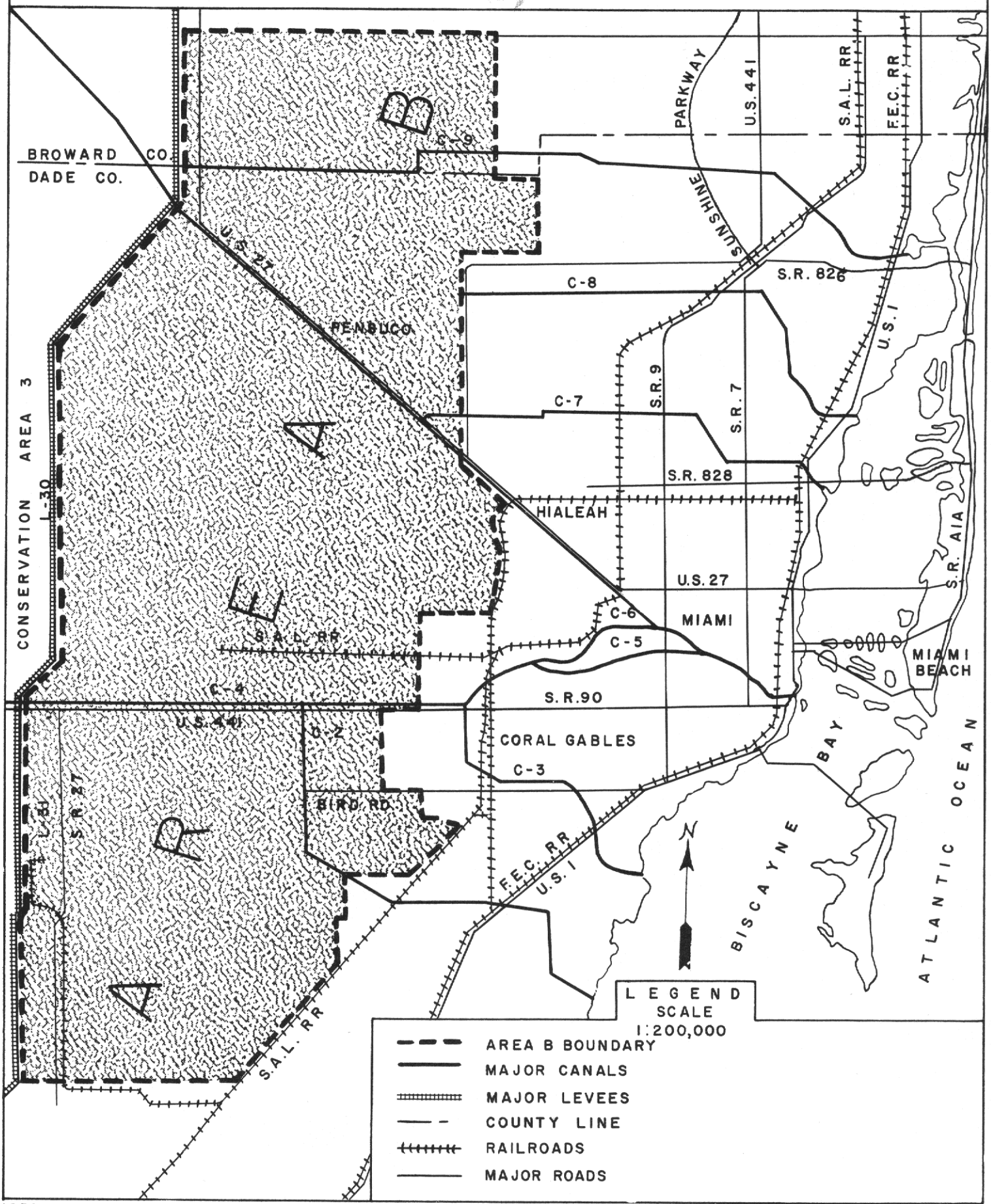
It is recommended that:

I. The District Engineer's report of July 9, 1958, a survey-review report on the Greater Miami Area (Area B) be returned to the District Engineer for revision in accordance with the desires of the Central and Southern Florida Flood Control District

and the Dade County Metropolitan government as set forth in this report.

II. The District Engineer be instructed to submit the revised survey-review report through normal channels in time for its consideration by the second session of the 86th Congress for inclusion in any Omnibus River and Harbor and Flood Control bill which may be passed by that Congress.

GREATER MIAMI AREA
OUTLINE MAP



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APPENDIX A

PRESENT AND PROJECTED LAND USE ANALYSIS OF "AREA B" DADE COUNTY, FLORIDA

by

Central and Southern Florida
Flood Control District

I. Introduction

The purpose of this report is to determine the amount and type of development which it is logical to expect in Area B within approximately 50 years or what is considered to be the life of the project. Since the future of Area B is directly dependent upon the urban growth of the coastal ridge in Metropolitan Miami, it is necessary to enlarge the scope of this study to include all the land in Dade and Broward Counties which is directly contiguous to Area B and east and south thereof. For the purposes of this study, Area B consists of 150,400 acres (235 square miles) of mainly low lying, poorly drained lands situated between the coastal ridge on the east which is occupied by the greater Miami urban area and the Central and Southern Florida Flood Control Project levees on the west.

Basic information in this report was obtained from aerial photographs, field checking, personal interviews and printed information obtained from the following sources:

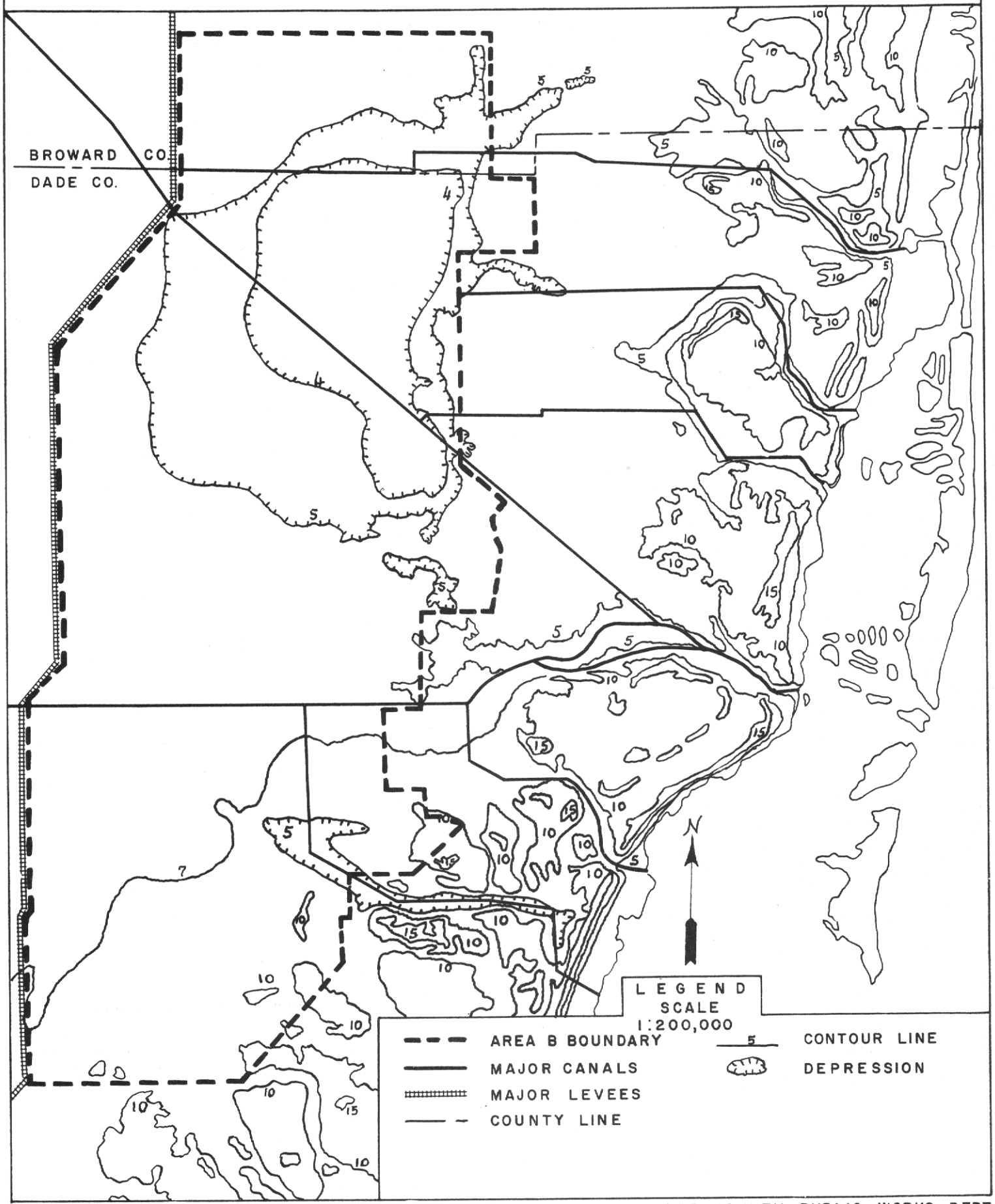
1. Broward County Agricultural Agent, Fort Lauderdale
2. Broward County Planning Dept., Fort Lauderdale
3. Bureau of Business & Economic Research, Coral Gables
4. Dade County Agricultural Agent, Miami
5. Dade County Building & Zoning Dept., Miami
6. Dade County Chamber of Commerce, Miami
7. Dade County Development Dept., Miami
8. Dade County Planning Dept., Miami
9. Dade County Public Works Dept., Miami
10. Florida Power & Light Corporation, Miami
11. U. S. Army Corps of Engineers, Jacksonville
12. U. S. Geological Survey, Miami
13. U. S. Census Bureau, Washington
14. Land Owners & Real Estate Agents with interests in the Area

II. Physical Geography

Area B is a relatively low area ranging from less than four feet above

GREATER MIAMI AREA

SURFACE CONTOUR MAP

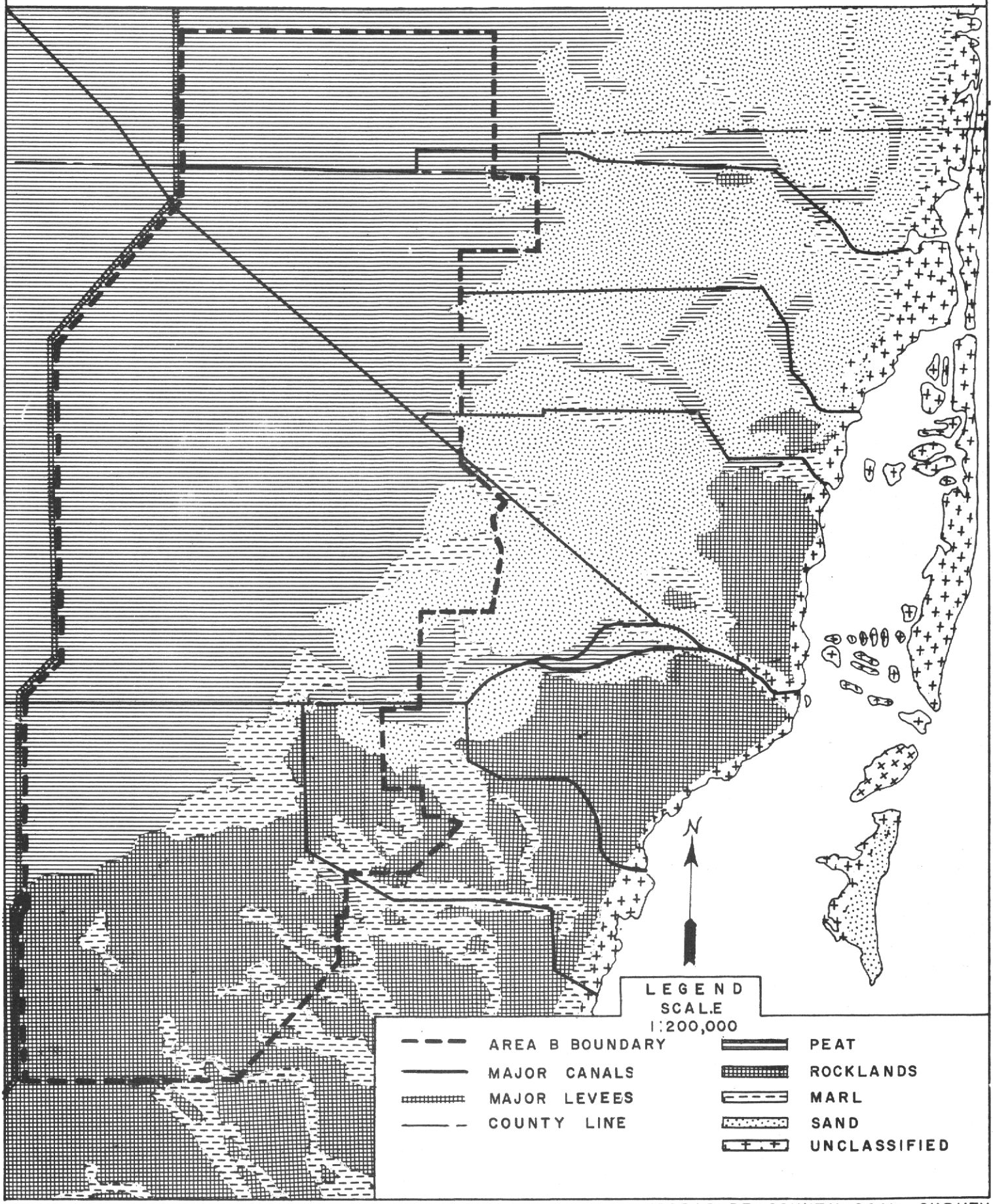


1959

SOURCE: DADE COUNTY PUBLIC WORKS DEPT.

GREATER MIAMI AREA

SOIL MAP



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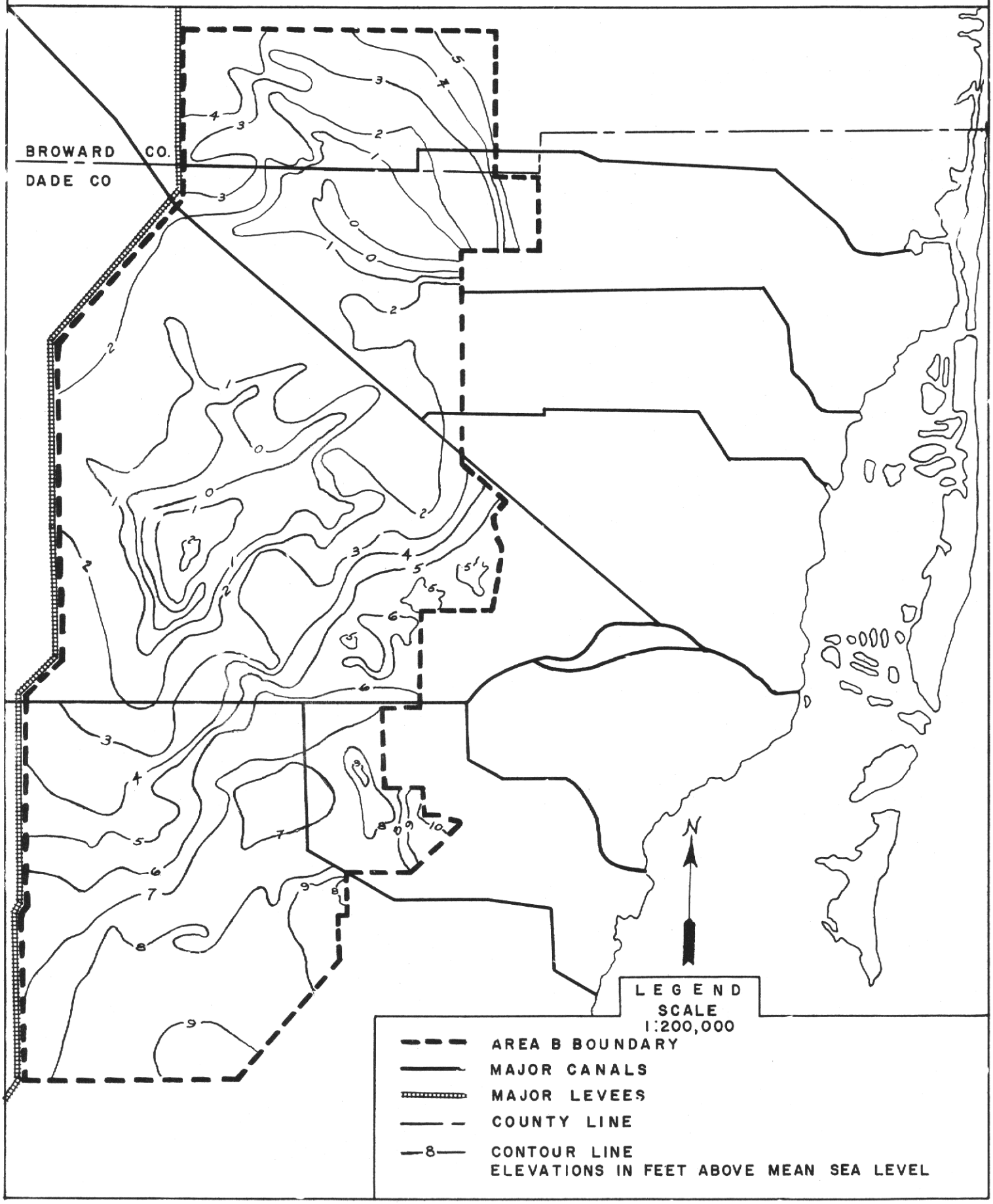
SOURCE: DADE COUNTY SOIL SURVEY

GREATER MIAMI AREA
TOP OF SOLID MATERIAL



1959

SOURCE: U.S. ARMY, C. OF E.

sea level around Pennsuco to over ten feet in the southern end of the area. Due to its low elevation and the fact that insufficient drainage outlets have been provided, much of the land is continually inundated and most of the remainder is covered by water following periods of heavy rainfall. A contour map of the area can be found on the following page.

On page 3 is a soil map of Area B and related areas. A comparison of this map and the contour map on Page 2 indicate the relationship of muck soils to low land west of the coastal ridge while the ridge itself is composed of porous limestone or sandy soils. Marl soils occur mainly in breaks in the limestone and sand ridge. Since the muck is subject to oxidation and eventual disappearance when exposed to air by drainage, a contour map of present ground surface can be very misleading. For this reason, a contour map indicating the "Top of Solid Material" is included on page 4.

III. Past Land Use

Attempts to develop portions of Area B have not achieved notable success. The Pennsylvania Sugar Company at one time owned a large portion of Area B lying north of the Tamiami Trail, sold much of it, and eventually failed in their attempt to produce sugar economically at Pennsuco on the present location of Graham's Dairy. Numerous agricultural enterprises have succeeded in varying degrees on the higher elevations at the eastern and southern fringes of Area B but those which moved toward the lower areas have, almost without exception, met with failure.

IV. Present Land Use

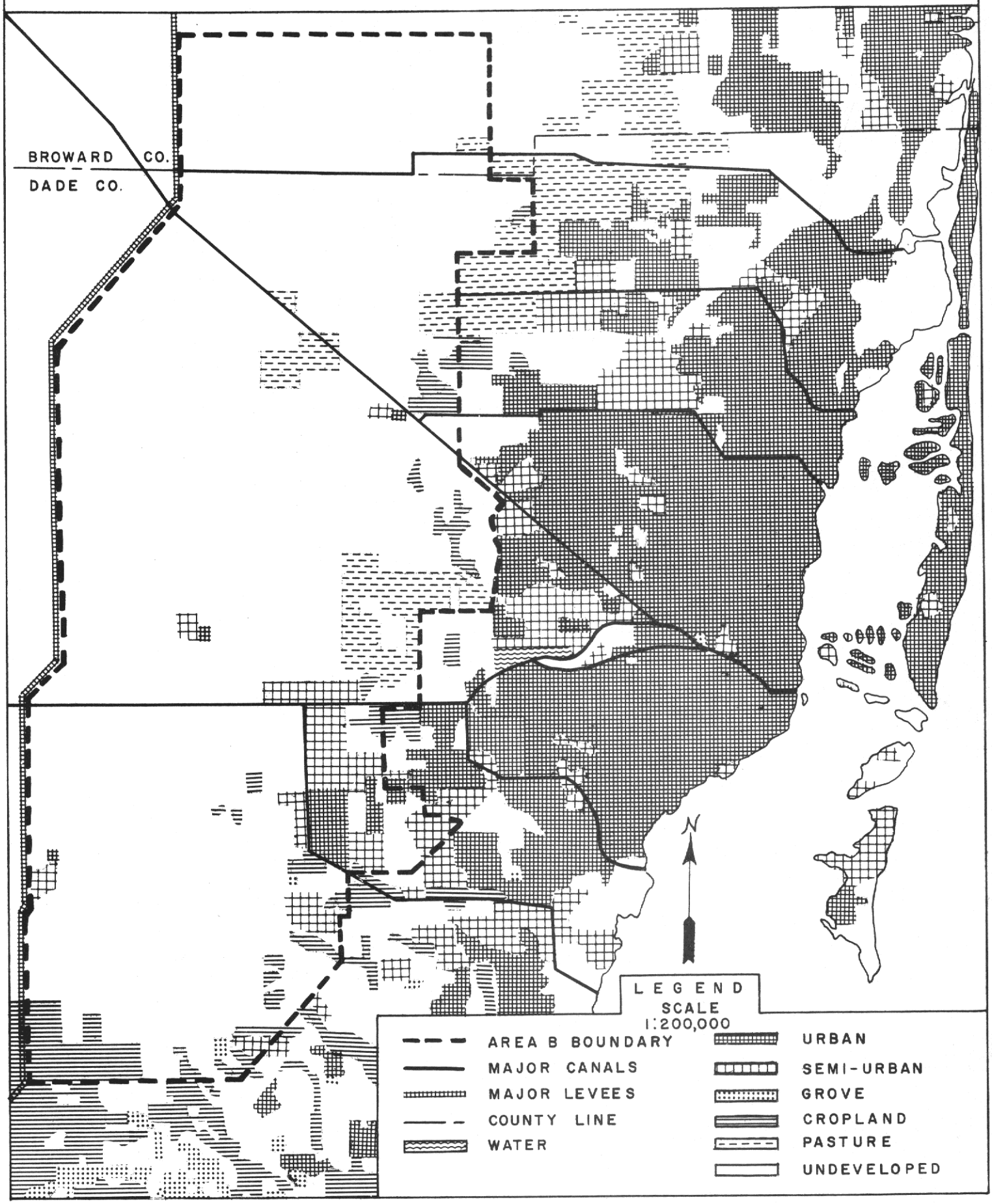
The present land use was determined from aerial photographs, field reconnaissance, and aerial reconnaissance. The map showing the results of these investigations can be found on the following page.

The following categories and their definitions were used on three land use maps in this study.

1. Urban -- Any residential, commercial, or industrial agglomeration of 40 acres or more in extent and having at least one building or 1,000 square feet of floor space per acre.

2. Semi-urban -- A transitional category developed to distinguish land use with urban characteristics but without the intensity of development to warrant inclusion in the urban category. Included are airports, parks, cemeteries, golf courses, active mines and rock pits, well fields and residential, commercial, or industrial agglomerations of 160 acres or more with a density of at least one building or 1,000 square feet of floor space for each five acres.

GREATER MIAMI AREA
PRESENT LAND USE



1959

3. Grove -- All perennial tree fruit crops such as citrus, mangoes, avocados, and nuts.

4. Cultivated Cropland -- Land devoted to truck and field crops and specialties such as flowers, sugar cane, or nurseries.

5. Improved Pasture -- All pasture land on which improved grasses are established and which has been cleared, drained, fertilized regularly, or irrigated.

6. Undeveloped Land -- All land not in the previous categories whether it be used as native range, forest land, or completely unused.

The following observations can be made after study of this map.

1. Urban growth has not quite reached the boundaries of Area B north of the Miami Canal but has moved to the boundary between the Miami & Tamiami Canals. In the vicinity of Snapper Creek there has been a large amount of urban development in Area B within recent years while in the higher land south of this canal, very little growth has taken place. Two large cement plants account for the spots of urban use in the center and along the western boundary of the area.

2. Semi-urban use in the Snapper Creek Area consists largely of sparsely settled residential areas and the Tamiami Airport while other spots in Area B largely represent active rock mining operations.

3. A large number of groves consisting mainly of limes, mangoes, and avocados are largely confined to the better drained rocklands south of Area B.

4. Scattered vegetable fields are found all along the fringe of urban and semi-urban development while a large area of solidly cultivated cropland is found in the southwest corner of the area.

5. Improved pasture occurs only north of the Tamiami Canal and most of it lies to the east of Area B.

V. Future Land Use

The method used to determine the expected future land use requires some additional explanation. Basic to any land use study of an area in which a large amount of urban growth is expected is a population estimate. Since Area B has very little in the way of natural resources or population supporting economic base its growth is directly dependent upon the growth of Dade and Broward Counties. Therefore, a population analysis of these two counties is essential before any determination can be made for Area B.

The first step was to compile all existing census figures, estimates, and projections concerning the population growth of Florida, and Dade and Broward Counties. The Board of Engineers for Rivers and Harbors has prepared a population estimate for South Florida which indicates that Dade County can expect a population of 5,513,000 by 2010, apparently without the consideration of a project for Area B. Since this is considerably higher than any previous population projections, it was decided to average this estimate with three other recent projections for Dade County to arrive at a composite of the judgment of various population analysts. The Broward County estimate was based on sources 1 and 4.

Sources of these estimates were:

1. "Estimated Future County Population in a 17-county Florida area for 1961-2010."
   Board of Engineers for Rivers and Harbors, U. S. Army Corps of Engineers, 27 Nov. 56.

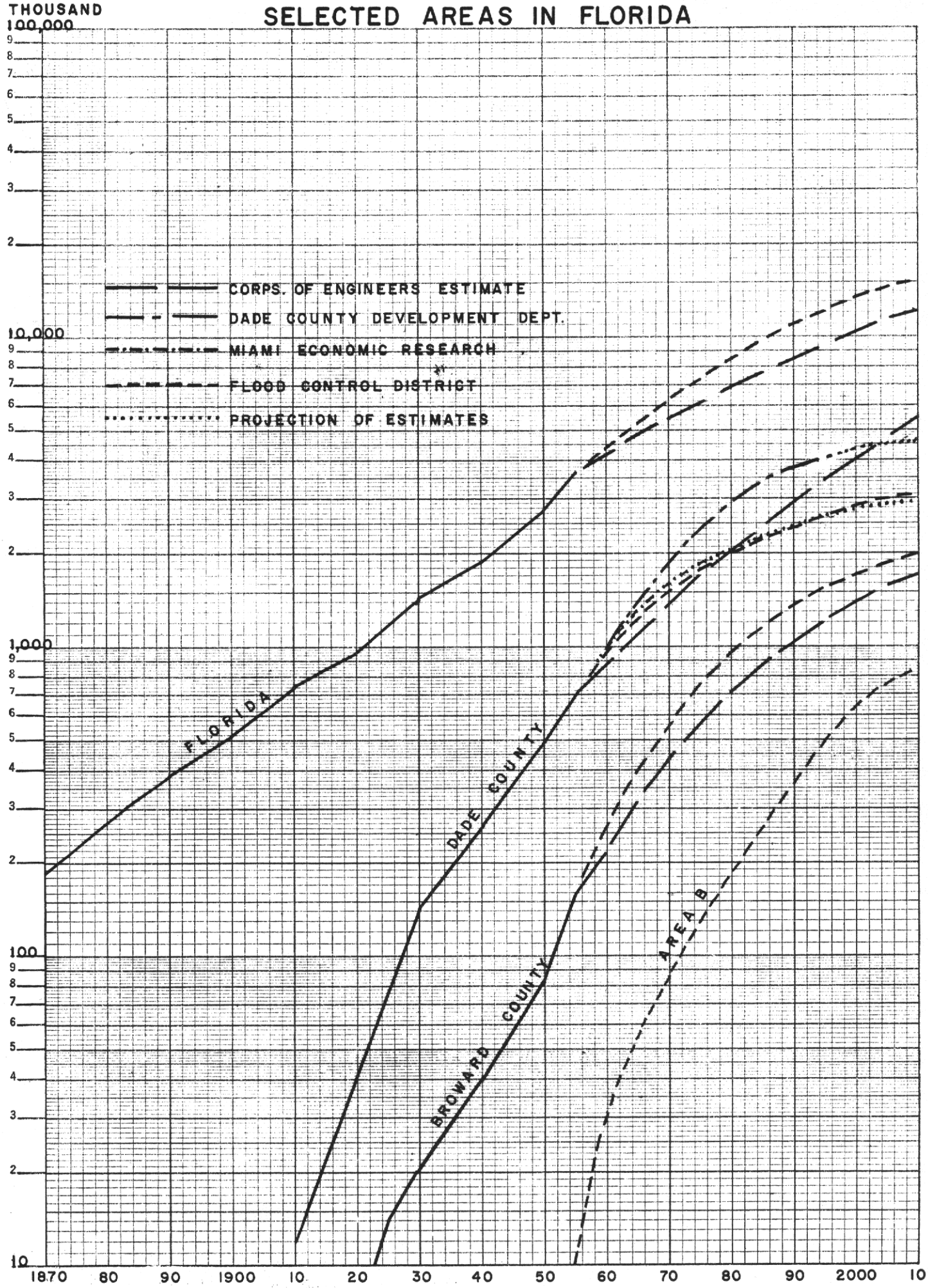
2. "Possible Future Water Needs of Dade County, Florida,"
   Dade County Development Dept., 1958, Miami, Florida

3. "Population and Housing Survey of April 1, 1958" in
   Miami Economic Research, University of Miami, Coral Gables, Florida

4. "Present and Projected Land Utilization of the South Dade County Area" Central and Southern Florida Flood Control District, 7 May 1958.

On the following pages is a population graph showing the various projections used and a table of the composite estimates accepted for use in this report.

PAST AND PROJECTED POPULATION FOR SELECTED AREAS IN FLORIDA



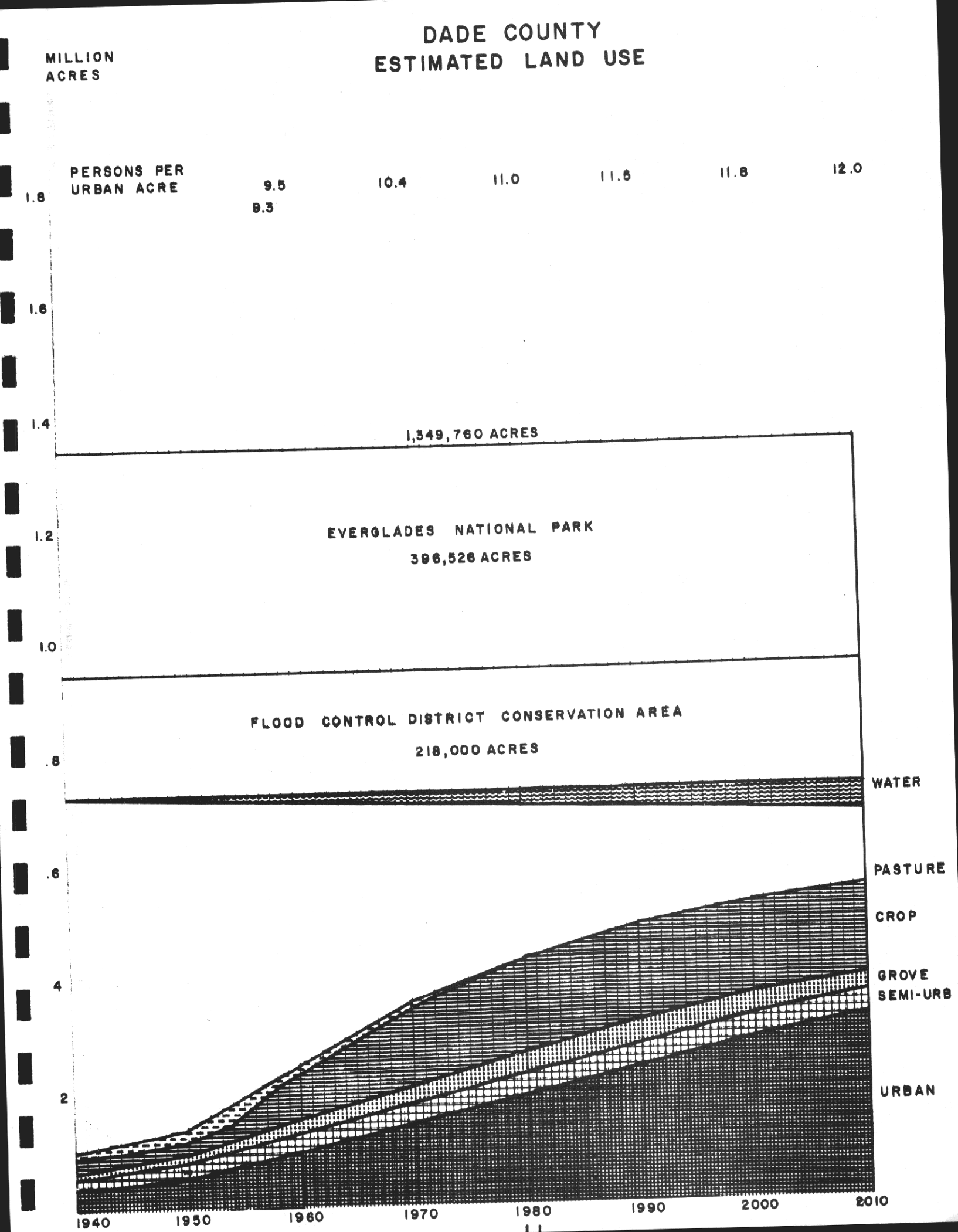
PAST AND PROJECTED POPULATION ESTIMATES

FOR

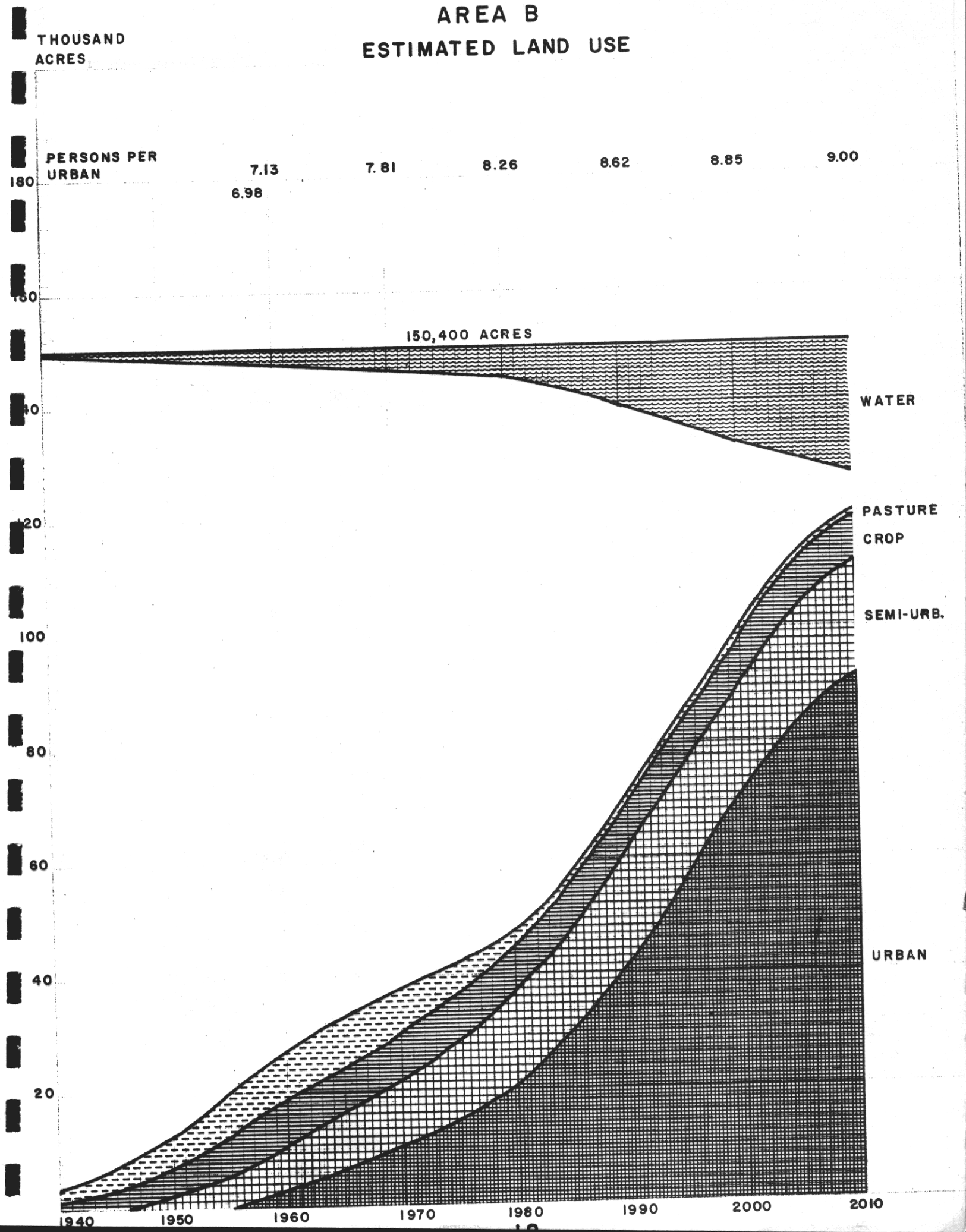
SELECTED AREAS IN FLORIDA
(in thousands)

Year	Florida	Broward	Dade County	Area B
1850	87			
1860	140		.1	
1870	188		.1	
1880	269		.3	
1890	391		.9	
1900	529		.5	
1910	753		12	
1920	968	5	43	
1930	1,468	20	143	
1940	1,897	40	268	
1950	2,771	84	495	3
1958	4,000	230	860	22
1960	4,268	248	960	32
1970	5,910	520	1,550	90
1980	7,715	840	2,200	185
1990	9,800	1,250	2,800	362
2000	11,950	1,550	3,400	652
2010	13,563	1,850	3,900	847

DADE COUNTY
ESTIMATED LAND USE



AREA B
ESTIMATED LAND USE



These population figures for Dade and Broward Counties were related to present and estimated future population densities to determine the amount of land required to provide for expected growth. It was assumed that although some additional urban development is expected to take place continually in Area B, most of the growth will occur when the area to the east of Area B is completely occupied. This will result in a growth rate much greater than that for the whole of Dade County.

Of interest is the fact that nearly half of the area of Dade County has been restricted from development by its inclusion in either the Everglades National Park or the Flood Control District Conservation Area Number 3. Most of the remaining area in Dade County and most of Area B will be developed by the year 2010.

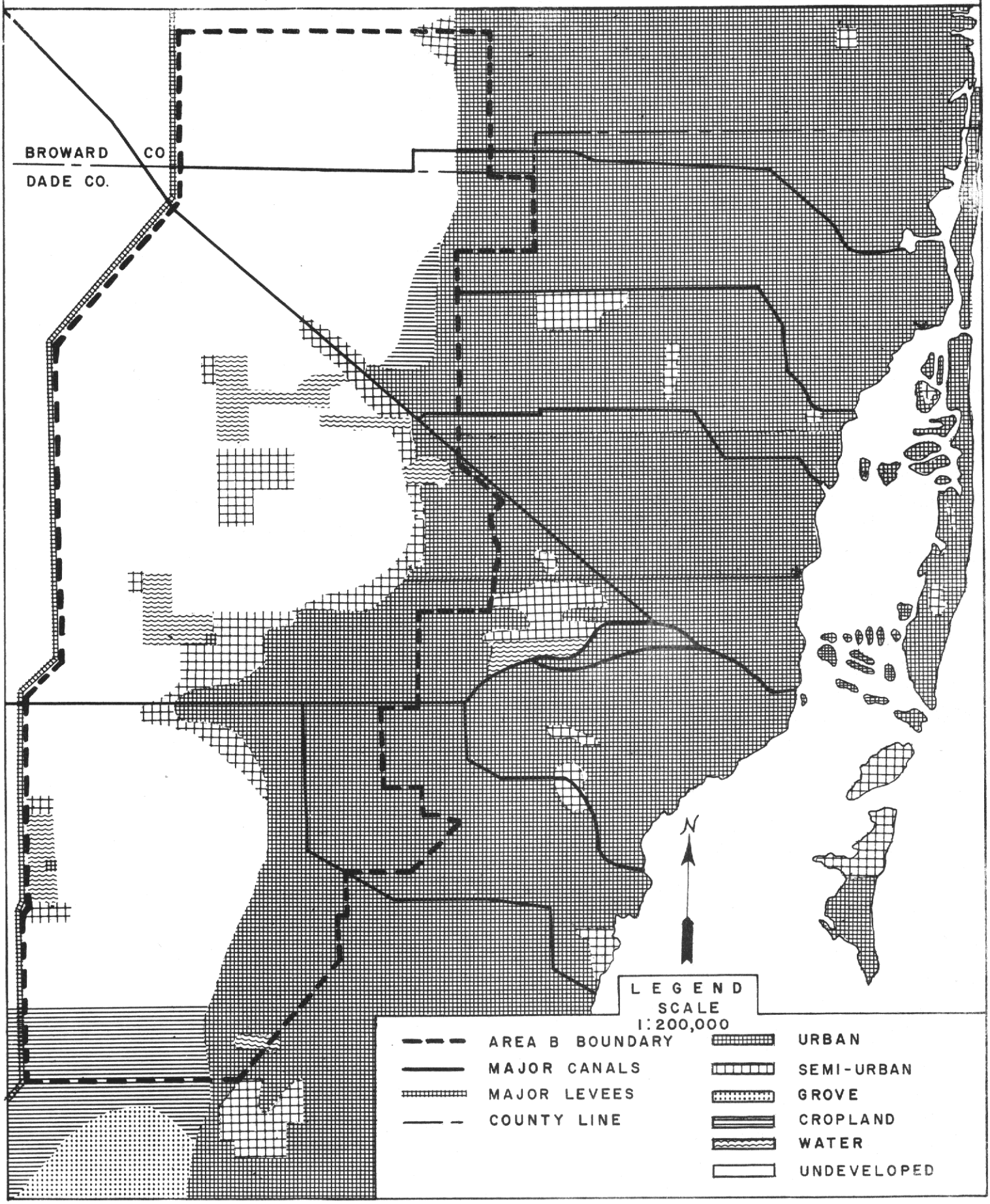
Since urban and semi-urban land use is the most intensive possible use of the land, agricultural development can logically take place only on the remaining land which is not as favorably situated for urban uses.

Grove land is the next most intensive use and although some additional acreage is expected to be put to this use in Dade County, little if any will occur in Area B because of competition with urban uses on the higher land and inadequate drainage on the remainder.

Although cropland in Dade County will experience a considerable increase in area, the amount in Area B will stay relatively uniform through the life of the Project. Some leased acreage will be cropped on the western fringe of urban development but little permanently developed acreage will occur except that bordering the South Dade Agricultural area. Problems in addition to poor drainage are soil subsidence and the diminished tempering effect of the Gulf Stream resulting in a difference in minimum temperatures of nearly 10 degrees in comparison to coastal areas. A comprehensive project for Area B would enable farmers to provide economical permanent improvements to the land and certainly result in increased farming in Area B. The future of both fruit and vegetable crops in Dade County is dependent to a great extent upon politics, tariff policies and import restrictions affecting Mexico, Cuba, and other Middle American Countries. It is beyond the scope of this Report to delve into these intricate matters.

Recent studies seem to indicate that beef and dairy farms are definitely on the way out in Dade County. A sizeable reduction in cattle numbers has already taken place and further dwindling is expected until about 1980 when a minor number of riding academies and hobby farms will provide all the available improved pasture in Dade County. A sizeable percentage of these will be in Area B.

GREATER MIAMI AREA
PROJECTED LAND USE - 1988



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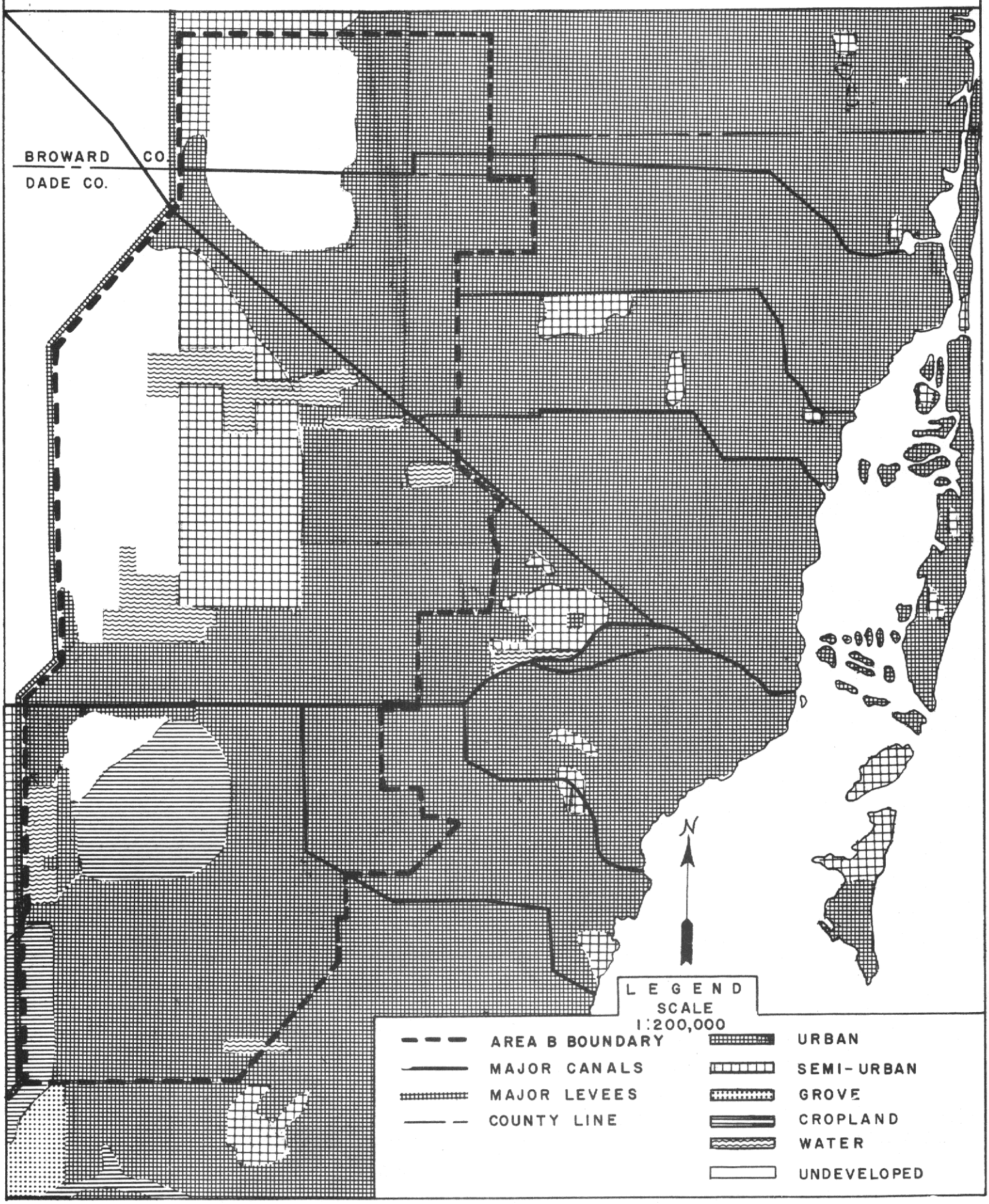
GREATER MIAMI AREA
PROJECTED LAND USE 2010 WITHOUT AREA B PROJECT



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The year in which the average future urban land use is expected to occur in Area B is 1988. Therefore, projected land use maps for 1988 and 2010, are provided on pages 14 and 15. Use patterns were based on present ownership, highway and railroad network, soil type and elevation. It is expected that much of the semi-urban and water areas will be interspersed in that area which is indicated as urban but the exact location is indeterminable.

VI. Conclusions

Without a comprehensive flood control project it is expected that:

1. Within 50 years 60% of Area B will be occupied by urban development having a total population of 850 thousand persons.

2. Approximately 13% of the area will fall in the category classified as semi-urban, being occupied mainly by airports, active rockpits, parks, cemeteries, and other non-intensive urban land uses.

3. Agricultural uses are not expected to play a major role in the development of the area but some usage will persist throughout the life of the project, amounting to possibly 5% of the total area.

4. Much of the remaining area will be in water bodies resulting from excavation for fill and rock to be used for construction purposes and cement production.

A flood control project in Area B would speed urban development but would not result in any great increase in the total development by the year 2010. On the other hand, agricultural usage would be considerably increased as long as there was sufficient space.

APPENDIX B

EXPLANATION OF OFFICIAL DADE COUNTY FLOOD CRITERIA

by F. D. R. Park*

In 1953 the Board of County Commissioners of Dade County set standards by means of a flood-criteria map, establishing minimum ground and road levels in the unincorporated areas of the County, and recorded this map for impartial use by builders, developers, and public agencies.

The necessity of such action became apparent in 1949, and the County Engineer's office established the first criterion in that year (FES Journal 1950). It was based on a relatively few canal and ground-water stages, with emphasis on the 1947 flood level and 1948 high water.

The need for closer analysis became urgent in Feb. 1953 when the State Health Department issued its so called "sudden death" rule for new subdivisions planned to utilize septic tanks. The County's present flood-criteria map was prepared at that time after considerable investigation by the public agencies involved and by a special committee including private engineers. The Florida Engineering Society program committee for this meeting (1956), together with E. A. Anderson, County Engineer, believing that an outline of the procedure used by Dade County may be of value to others faced with this problem, requested that an explanation be made as to: (1) How the County's map is used, and (2) How it was prepared.

EXPLANATION OF FLOOD-CRITERIA MAP

Plate 1 is a general map showing flood-criteria contours now in use. The contours are read as on any such map, interpolation being made for areas lying between contours. The elevations, based on mean sea level (USC&GS datum), are the minimum to which lots and street centerlines shall be filled in low areas prior to building construction. The original map, together with Resolution 6416 of the County Commission, is recorded in the Public Records of Dade County, PB 53, Pgs. 68-70, as indicated in the following copy of the Resolution.

The flood criteria contours were drawn overlying the County's topo maps which show natural ground contours at 1' intervals; and the difference between the two sets of contours indicates the amount of fill required. (See Plate 2). Copies of the County's topo maps so arranged are provided to the Zoning and Health Departments who are responsible for enforcement of the indicated requirements. The County Engineer's Office does not guarantee the amount of indicated fill to be exact because the topo maps are out of date.

The County's requirements are met if lots and street centerlines are set at the same level; however, some of the Federal agencies financing home building require lot levels to be 6" above the street centerline level. The County's require-

* Water-Control Engineer, Dade County Engineer's Office, Miami, Fla.

Plate 3 shows the various criteria considered. The final flood-criteria map was drawn from index points established in accord with above procedure, each point representing the higher requirement indicated by the two criteria described, namely the 10-yr. and the 5-yr. conditions mentioned. The final map therefore satisfies both criteria.

The method of tabulation and plotting used has been described as the Hazen Method (see Lindsey-Kohler-Paulhaus, Applied Hydrology, McGraw-Hill 1949, pg. 547); and an illustration of the plotting is given herein as Plate 4.

Over most of the County only minor differences were found between the 10-yr. - 1 day level and the 5-yr. -1 week-level plus 18 inches. However, where differences do exist, minor reductions can be made in the map elevations in areas where sewage disposal systems are used, provided the 5-yr. -1 week - plus 18" - criterion was the higher one for that area. Such reductions are possible not only because of the basis of determining the criterion, but also because the map as drawn (and approved by the County Commission) applies to septic tank areas.

Although the County's map was prepared for official use only in unincorporated areas, the contours were extended through municipalities and the data are available wherever a municipality desires to use them. Some of them have adopted the County criteria, however the City of Miami has prepared an independent map labelled "Alert Map" which is used by their building department.

Caution should be used in application of these methods to other areas, with special regard to the basis for setting the criteria, because in many portions of Florida the underground conditions may be less favorable for operation of septic tank drains, or floods there of the frequencies used herein may be more (or less) damaging than in Dade County areas; or other factors of climate, topography, health, or economics may require a different approach to solution of the problem.

ments apply uniformly in all areas whether residential or commercial. Standard specifications and drawings for construction of streets and drainage facilities are available.

In cases where a new project is to be subdivided by stages, grading and drainage plans for the overall project must be submitted and approved prior to subdividing any partial area. Any slope provided for drainage must rise upward from the flood criterion which establishes the lowest acceptable point (or points) in the area being developed.

Where fill is required in undeveloped areas surrounded by lowlands already developed, reasonable transitions must be provided between lot and street levels of the two adjoining areas, and special drainage facilities must be installed as necessary, by the developer, to prevent increased flood and ponding damage to areas already developed.

The flood-criteria contours are based on prior weather and flood data and on existing conditions of levees, channels, and water-control facilities. Changes in basic data require revisions of the contours: For example, recent major improvement of Snake Creek Canal led to appreciable reduction in the original fill levels required near the Canal. However, revisions are not made until such improvements are actually completed.

The procedure for filing new county subdivision plats, including the process for securing approval of the Water Control, Health, Planning, and Zoning Depts. was fully outlined by Fred Stockhausen, Land Surveyor, at the 8th Annual Surveying Conference, University of Florida, Oct. 1955 (See FES Journal, Feb. 1956).

HOW FLOOD-CRITERIA MAP WAS PREPARED

Basic data include: Observations of ground-water wells belonging to U. S. Geological Survey, U. S. Dept. of Agriculture, and the County Water Control Division, the records of these wells varying from 3 to 20 years, the average record being about 12 years. Canal stage records for about 12 years were also available; and tide gage records at a few sites were obtained, the longest record being at Miami Beach pier and covering 20 years.

The number of sites for which stage observations were available totalled about 133, but reliance was placed mainly on about 45 records. For each site the once-in-10-yr. stage (1 day duration) was determined from tabulations of the annual peak state; likewise, the once-in-5-yr. stage (1 week duration) was found from tabulation of the highest such occurrence annually.

The 10-yr. (1 day) criterion was set by the County Engineer as being a condition acceptable as to protection of roads and preventing excessive flooding of streets and adjacent lots. The 5-yr. (1 week) high-water level is a compromise finally reached with the Health Dept. as an acceptable flood level equal to the invert of septic tank drain tiles (which invert is set by Zoning standards at 18" below final ground level). Therefore, this high-water level plus 18" determines the minimum ground elevation acceptable to the Health Department.

COPY OF RESOLUTION NO. 6416
DADE COUNTY COMMISSIONERS

The following Resolution was offered by Commissioner Preston B. Bird, seconded by Commissioner Hugh Peters and upon vote was duly adopted:

WHEREAS because of the low elevations over much land in Dade County and the frequent heavy rains, a great deal of said lands become flooded from time to time, or are slightly above the elevation of flood waters; and

WHEREAS from time to time residents have installed septic tanks for the disposal of sewage, and such septic tanks and the drain fields therefor become flooded with surface and underground waters, as a result whereof the health of the inhabitants of the people of Dade County becomes endangered; and

WHEREAS under the law this Board is given the power to require that the health of the inhabitants of this County be protected insofar as may be possible; and

WHEREAS there has been prepared by the Water Control Division of the Dade County Engineer's office, with the aid of the Dade County Health Unit, a contour map of that portion of Dade County now actually occupied and reasonably expected to be occupied in the forseeable future, which map is dated October 12, 1953, comprises three sheets, and is recorded in Plat Book 53, pages 68, 69, and 70, of the Public Records of Dade County, Florida; and

WHEREAS said contour map, in the opinion of the Water Control Division of the Dade County Engineer's office, of the Dade County Health Unit, and of this Board, indicates the minimum elevation of the surface of the lands within which septic tanks and drain fields therefor may be installed in order to afford health protection to the inhabitants of Dade County; and

WHEREAS further studies and special circumstances in individual cases may hereafter require a revision of such map or of the requirements of this Resolution;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS as follows:

1. Said map aforesaid is hereby adopted as the official Flood Criteria Contour Map of the Unincorporated Areas of Dade County. Said map is not intended to be a representation to any person that buildings erected on or septic tanks installed in lands having minimum elevations as shown on said map will be safe from flood waters at all times, but is intended to reflect the present opinion of the Dade County Health Unit, the Water Control Division of the Dade County Engineer's office, and of this Board that the elevations shown are the minimum that should be permitted for the purposes expressed in this Resolution.

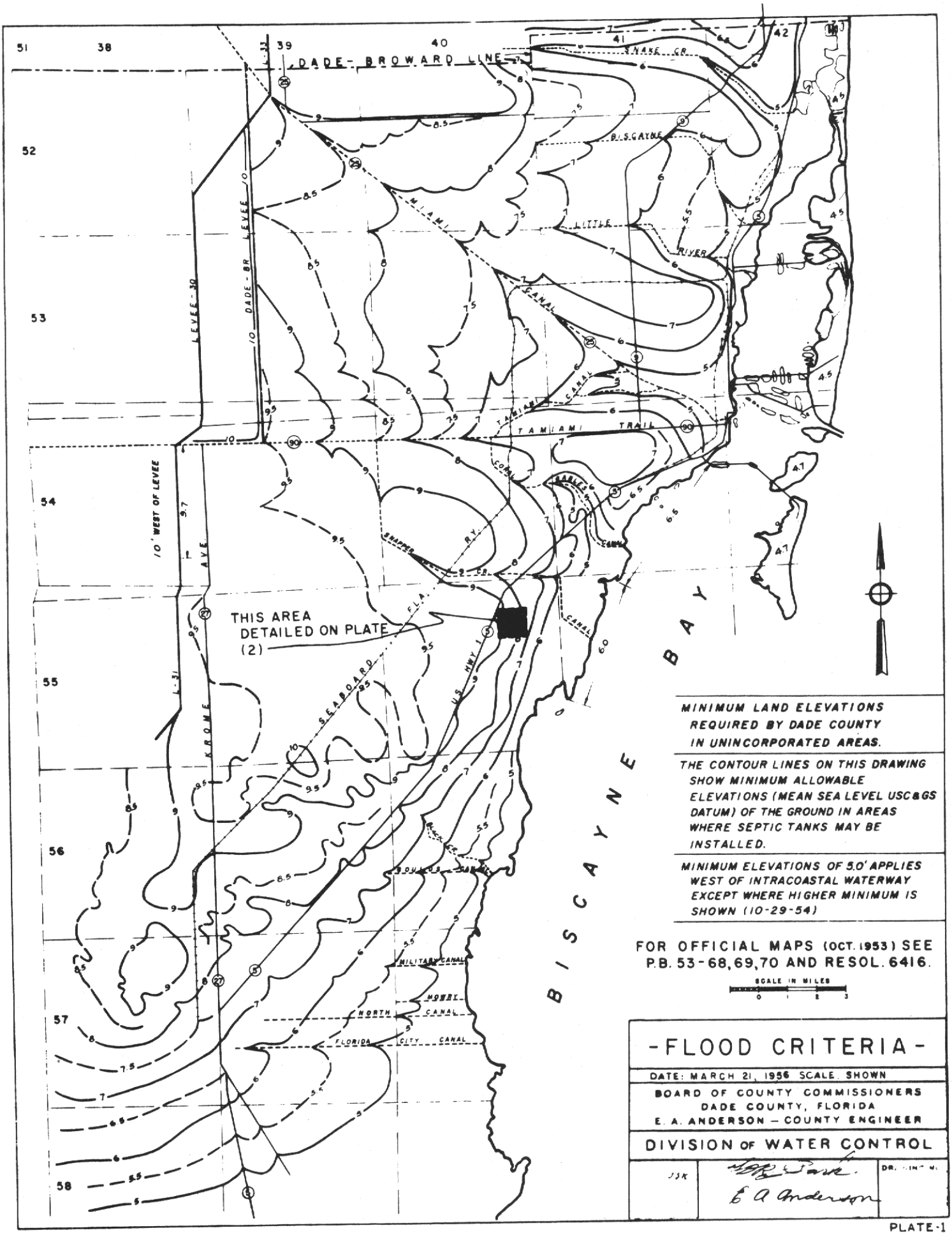
2. No permit for the installation of any septic tank in the unincorporated areas of Dade County shall be issued hereafter unless the surface of the ground wherein such septic tank and drain field therefor, after reasonable allowance for settlement, is, or before commencement of use of any such septic tank, will be at least at the elevation indicated on such map, and unless percolation tests and other requirements heretofore or hereafter established shall be met and complied with; PROVIDED, HOWEVER, that in particular cases where special circumstances clearly indicate that exceptions should be granted, such circumstances may be established by any applicant for such permit upon proper showing to the Dade County Health Unit, the Water Control Division of the Dade County Engineer's office, and this Board; PROVIDED FURTHER, that in those individual cases wherein septic tanks have already been installed legally and it becomes necessary to reinstall the same or drain fields therefor, permits may be issued upon approval thereof by the Dade County Health Unit and the Planning, Zoning & Building Department of Dade County; PROVIDED ALSO, that in those individual cases wherein buildings have already been legally erected on the date of this Resolution, as a result of which sewage disposal is required, such permits for septic tank installations may be issued upon approval of said Health Unit and said Planning, Zoning & Building Department.

3. Enlarged copies of said map shall be at all times displayed in the offices of the Water Control Division of the Dade County Engineer's office and of the Planning, Zoning & Building Department of Dade County.

4. If further study should reveal that amendments to said map or to this Resolution should be made either in whole or in part, such amendments may be made by this Board at any time.

5. The Clerk of this Board is hereby directed to cause to be recorded in the Public Records of his office a certified copy of this Resolution

PASSED AND ADOPTED THIS 20th day of October, 1953



MINIMUM LAND ELEVATIONS REQUIRED BY DADE COUNTY IN UNINCORPORATED AREAS.

THE CONTOUR LINES ON THIS DRAWING SHOW MINIMUM ALLOWABLE ELEVATIONS (MEAN SEA LEVEL USC&GS DATUM) OF THE GROUND IN AREAS WHERE SEPTIC TANKS MAY BE INSTALLED.

MINIMUM ELEVATIONS OF 5.0' APPLIES WEST OF INTRACOASTAL WATERWAY EXCEPT WHERE HIGHER MINIMUM IS SHOWN (10-29-54)

FOR OFFICIAL MAPS (OCT. 1953) SEE P.B. 53-68,69,70 AND RESOL. 6416.

SCALE IN MILES 0 1 2 3

-FLOOD CRITERIA-

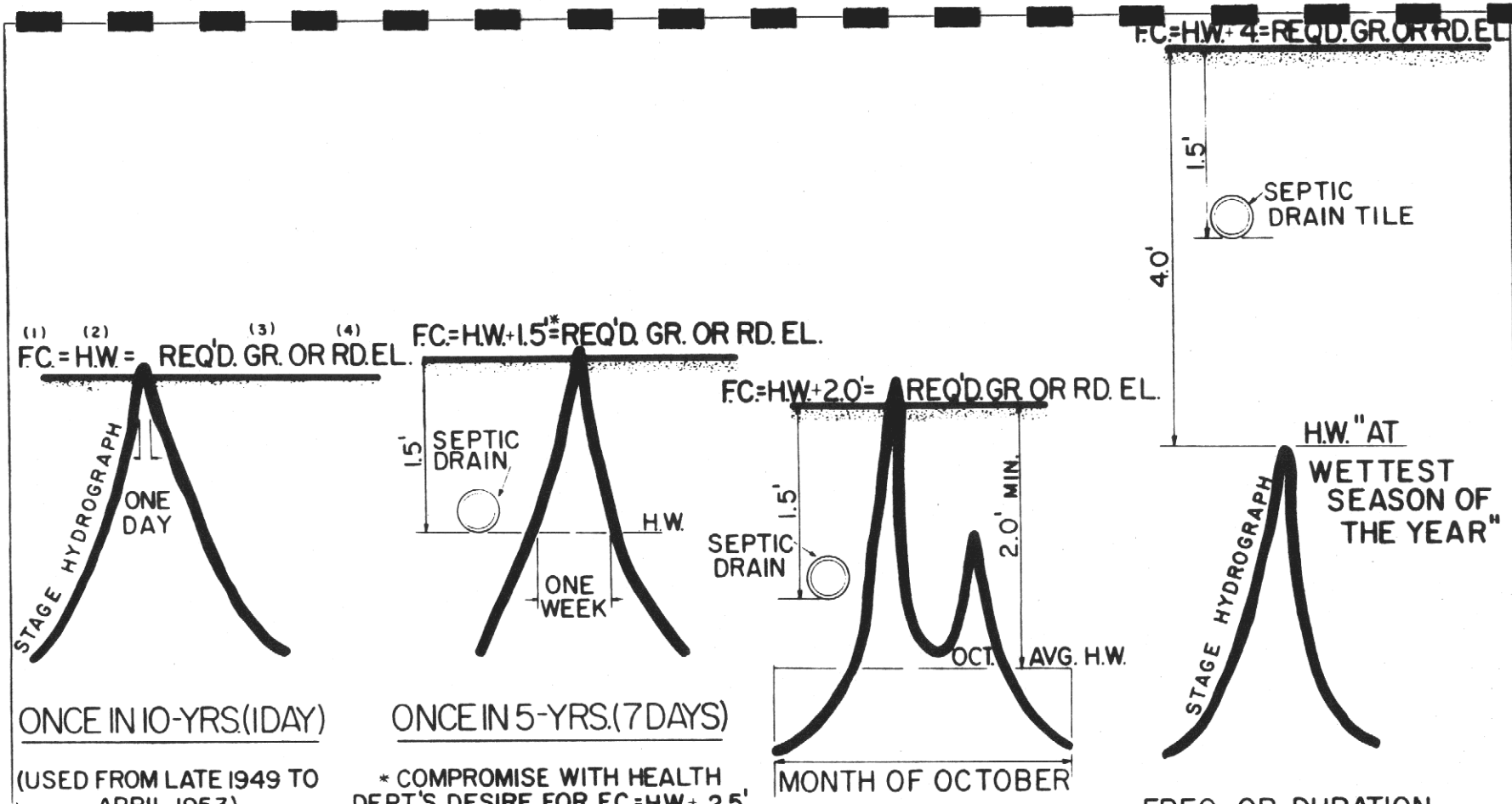
DATE: MARCH 21, 1956 SCALE SHOWN

BOARD OF COUNTY COMMISSIONERS
DADE COUNTY, FLORIDA
E. A. ANDERSON — COUNTY ENGINEER

DIVISION OF WATER CONTROL

JSK	E A Anderson	DR. CHK. M.

PLATE-1



ONCE IN 10-YRS.(1DAY)

(USED FROM LATE 1949 TO APRIL 1953)

ONCE IN 5-YRS.(7DAYS)

* COMPROMISE WITH HEALTH DEPT'S DESIRE FOR F.C.=H.W.+ 2.5'

CONSIDERED (NOT USED)

FREQ. OR DURATION NOT DEFINED

ST. HEALTH DEPT. MEMO OF FEB. 1953.

PRESENT FLOOD CRITERIA MAP IS BASED ON THE HIGHER REQUIREMENT OF THESE TWO

LEGEND:

(1) FC = FLOOD CRITERION

(2) HW = HIGH WATER

(3) GR = GROUND

(4) RD = ROAD

COMPARATIVE FLOOD CRITERIA

DATE: MARCH 13, 1956. SCALE: NONE

BOARD OF COUNTY COMMISSIONERS
DADE COUNTY, FLORIDA
E. A. ANDERSON – COUNTY ENGINEER

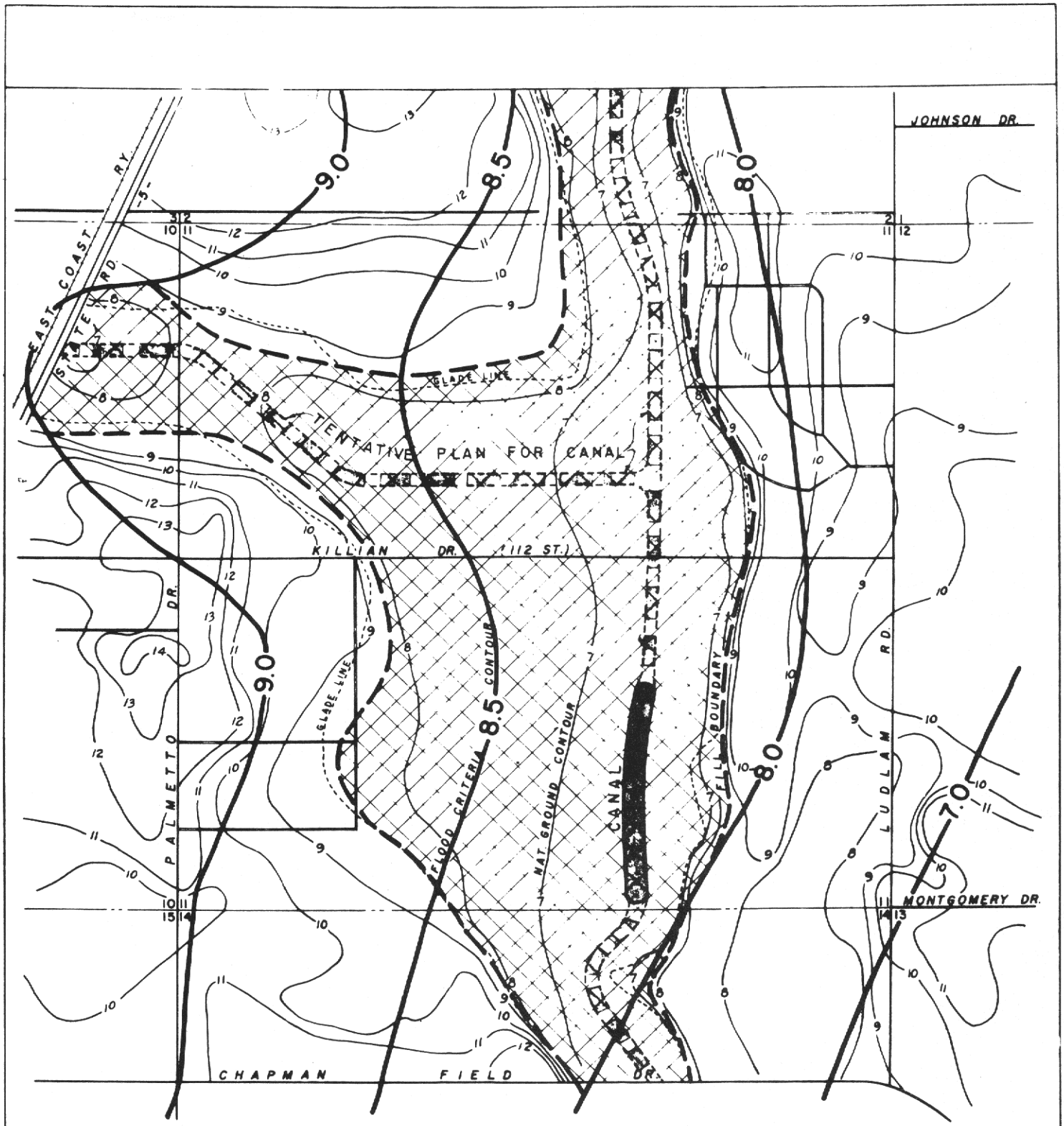
DIVISION OF WATER CONTROL

PCM

E. A. Anderson

PLATE-3

PLATE-3



NOTE:

AMOUNT OF FILL IS INDICATED BY DIFFERENCE BETWEEN GROUND AND FLOOD CRITERIA CONTOURS, AND AREA OF FILL IS CROSS HATCHED.

0 500 1000 2000
SCALE IN FEET

PROVISIONAL ..... SUBJECT TO REVISION

LAND FILL REQUIRED

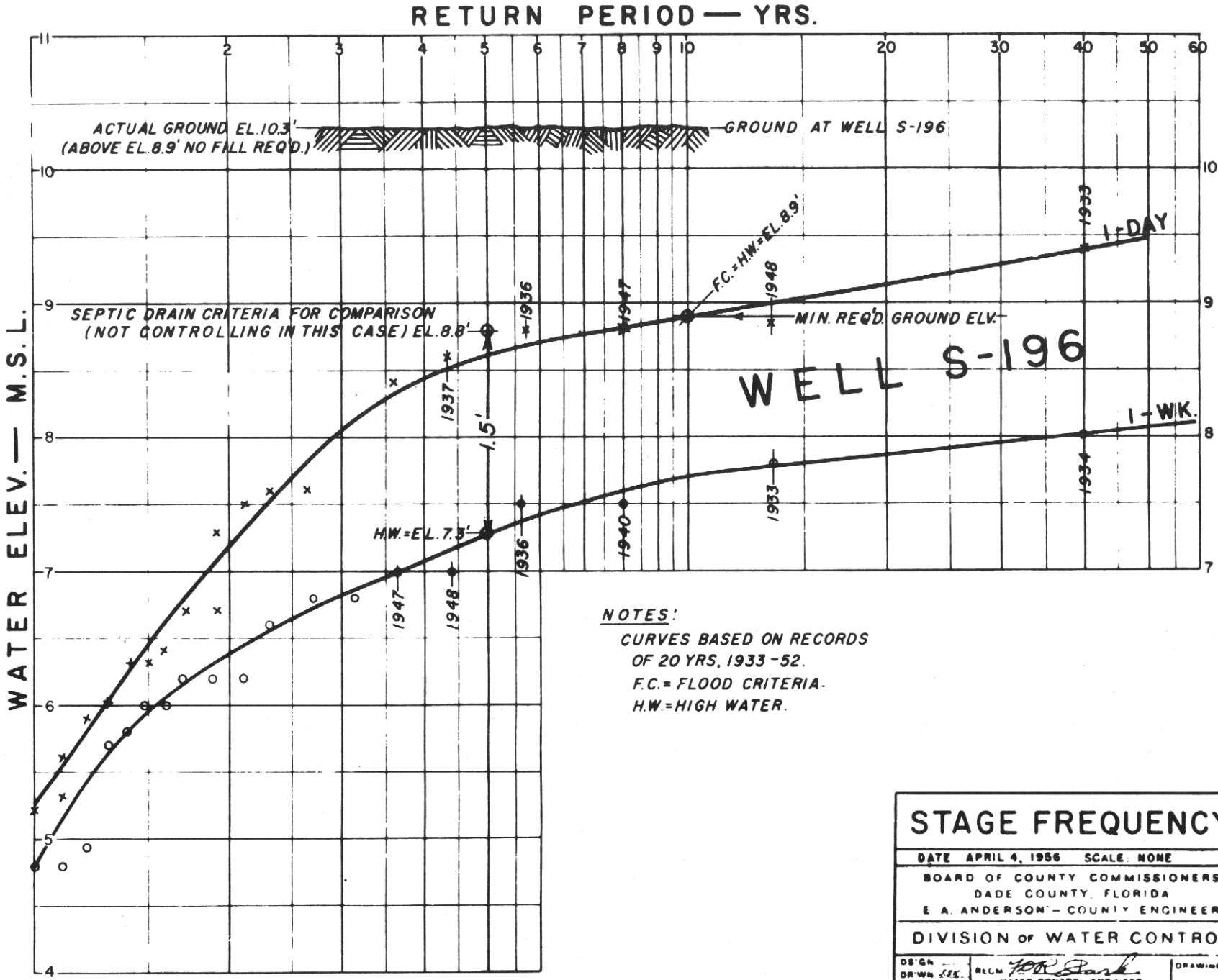
DATE. APRIL, 2, 1956 SCALE SHOWN

BOARD OF COUNTY COMMISSIONERS
DADE COUNTY FLORIDA
E. A. ANDERSON - COUNTY ENGINEER

DIVISION OF WATER CONTROL

DES'GN		RECM	WATER CONTROL ENGINEER
DR'WN	J.S.K.	APPR	COUNTY ENGINEER
TR'CD			DRAWING NO.
CH'KD			
SUB'M			SHEET

PLATE-2



NOTES:
CURVES BASED ON RECORDS
OF 20 YRS, 1933-52.
F.C. = FLOOD CRITERIA.
H.W. = HIGH WATER.

STAGE FREQUENCY

DATE APRIL 4, 1956 SCALE: NONE

BOARD OF COUNTY COMMISSIONERS
DADE COUNTY, FLORIDA
E. A. ANDERSON — COUNTY ENGINEER

DIVISION OF WATER CONTROL

DS'GN
DR'WN
TR'CD
CH'KD
SUB'M

RECM. F. R. Sark
WATER CONTROL ENGINEER
APPR. E. A. Anderson
COUNTY ENGINEER

DRAWING NO.
SHEET

PLATE-4

PLATE-4

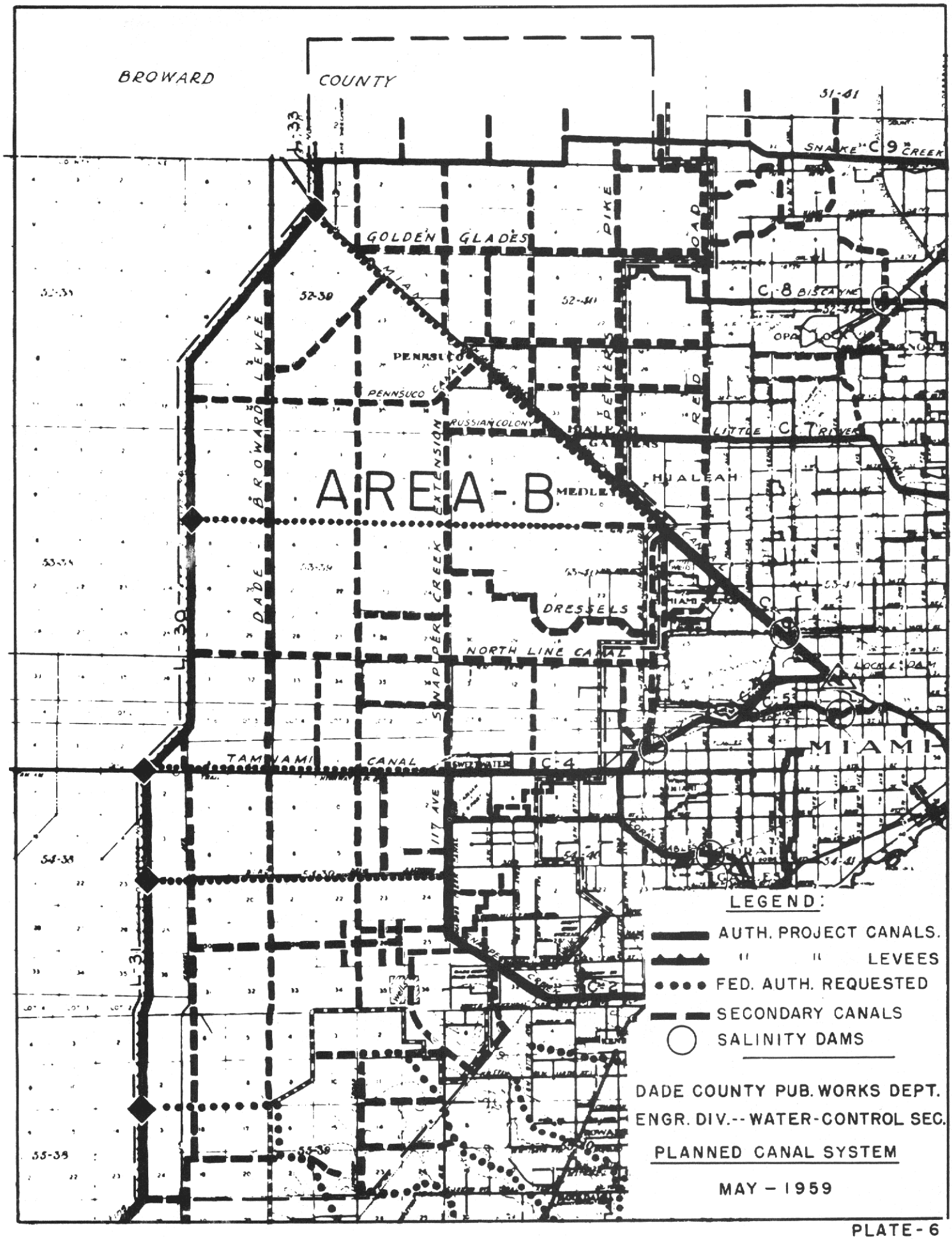
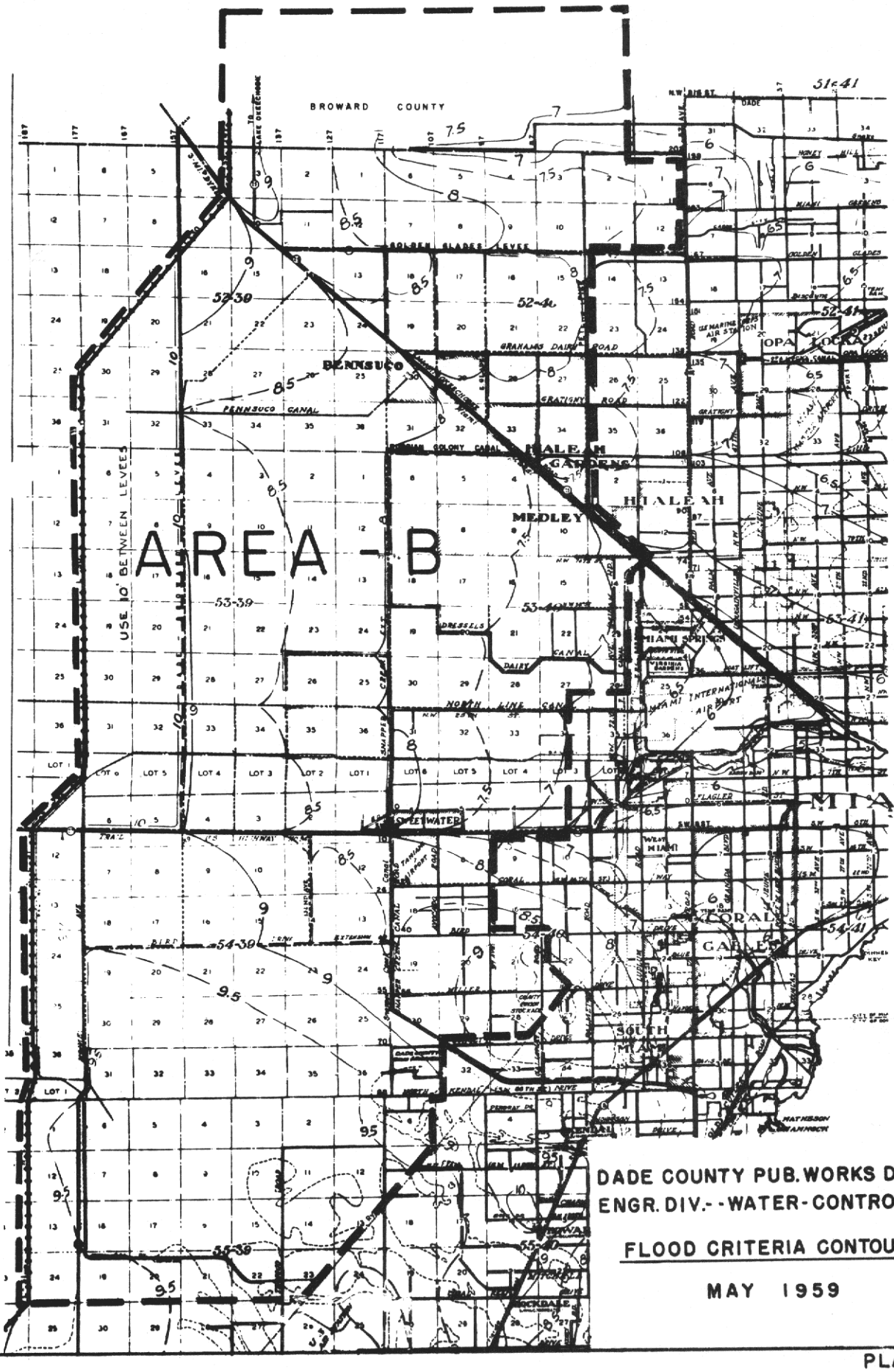

BROWARD COUNTY
GOLDEN GLADES
PENNSUCO
PENNSUCO CANAL
RUSSIAN COLONY
HIALEAH GARDENS
HIALEAH
MEDLEY
AREA-B
DADE BROWARD LEVEE
SNAPPER CREEK EXTENSION
117 AVE
DRESSELS
NORTH LINE CANAL
TAMIAMI CANAL
SWEETWATER
MIAMI
CORAL GABLES
SNAKE CREEK
C-9
C-8
C-7
C-5
C-4
C-2
BISCAYNE
LITTLE RIVER
PETERS PIKE
RED ROAD
L-30
L-31
L-33
LEGEND:
AUTH. PROJECT CANALS.
" " LEVEES
FED. AUTH. REQUESTED
SECONDARY CANALS
SALINITY DAMS
DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV.--WATER-CONTROL SEC.
PLANNED CANAL SYSTEM
MAY - 1959

PLATE-6

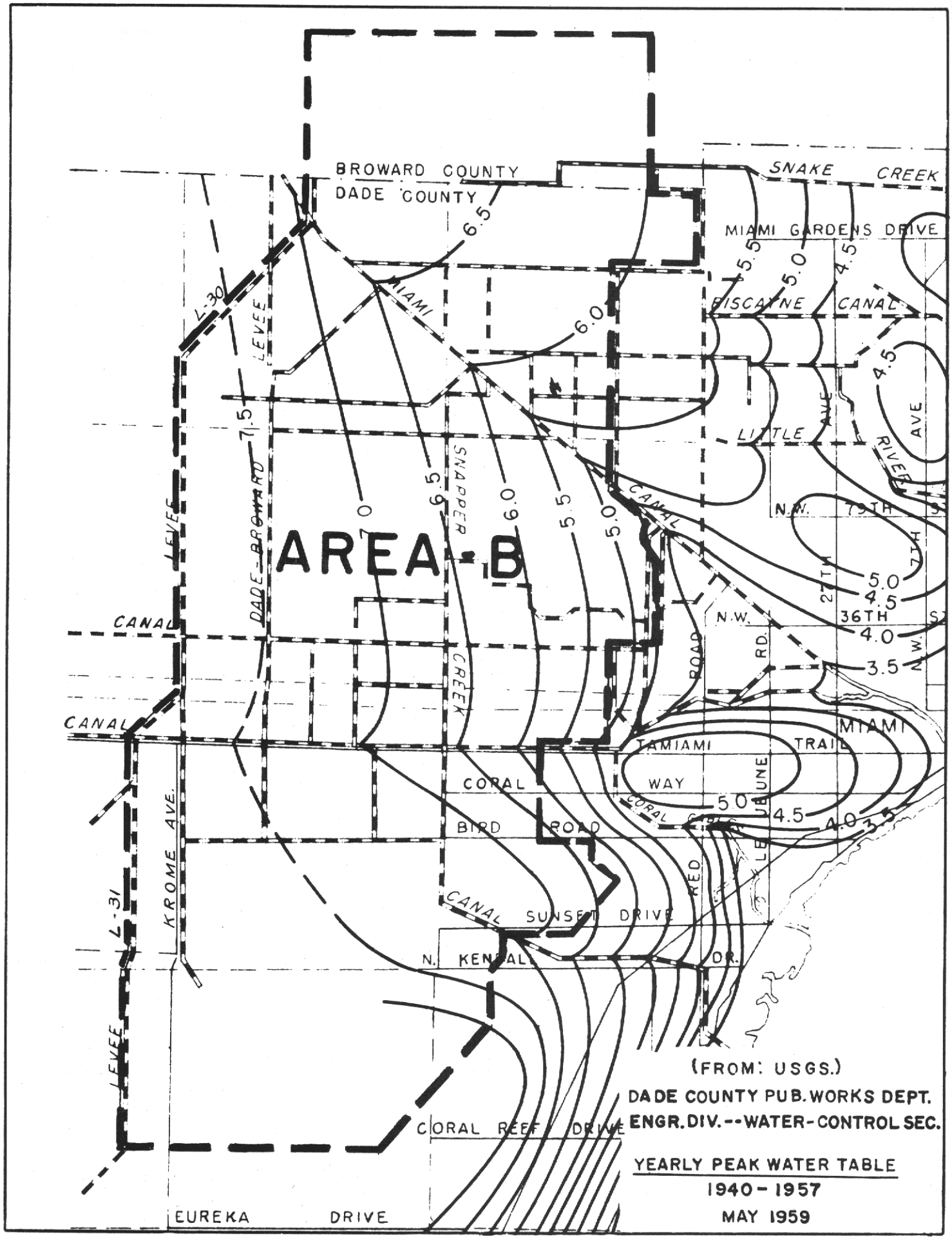


DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV. - - WATER - CONTROL SEC.

FLOOD CRITERIA CONTOUR MAP

MAY 1959

PLATE - 9



(FROM: USGS.)

DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV.--WATER-CONTROL SEC.

YEARLY PEAK WATER TABLE
1940 - 1957
MAY 1959

PLATE-10

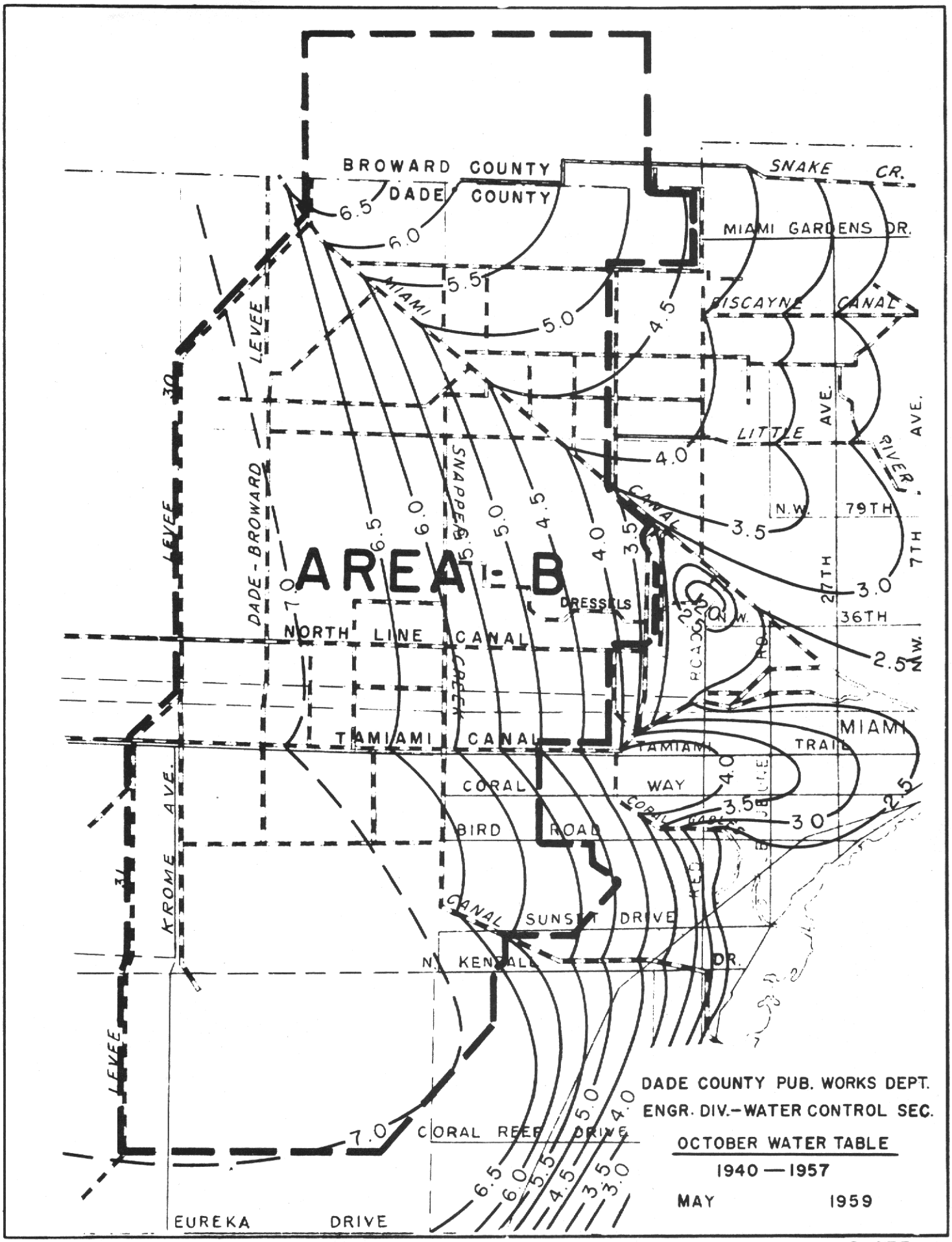
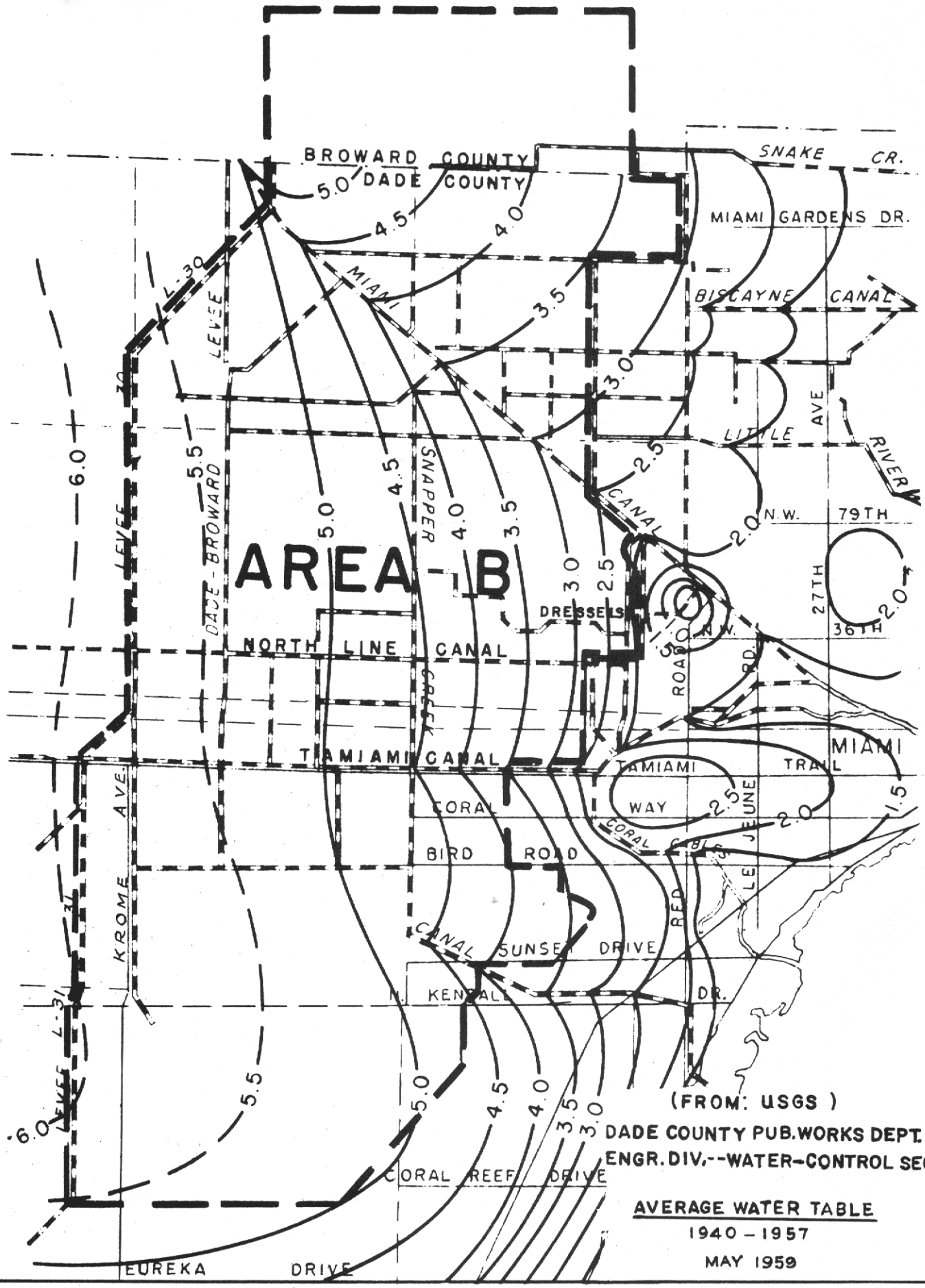

BROWARD COUNTY
DADE COUNTY
SNAKE CR.
MIAMI GARDENS DR.
MIAMI CANAL
LEVEE 30
DADE-BROWARD LEVEE
SNAPPER CREEK CANAL
BISCAYNE CANAL
LITTLE RIVER
N.W. 79TH AVE.
N.W. 27TH AVE.
N.W. 7TH AVE.
AREA B
DRESSELS
NORTH LINE CANAL
N.W. 36TH
TAMIAMI CANAL
TAMIAMI TRAIL
MIAMI
CORAL WAY
BIRD ROAD
CORAL REEF CANAL
SUNSET DRIVE
N. KENDALL DR.
KROME AVE.
LEVEE 37
CORAL REEF DRIVE
EUREKA DRIVE
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
7.0
DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV.—WATER CONTROL SEC.
OCTOBER WATER TABLE
1940 — 1957
MAY 1959

PLATE - II

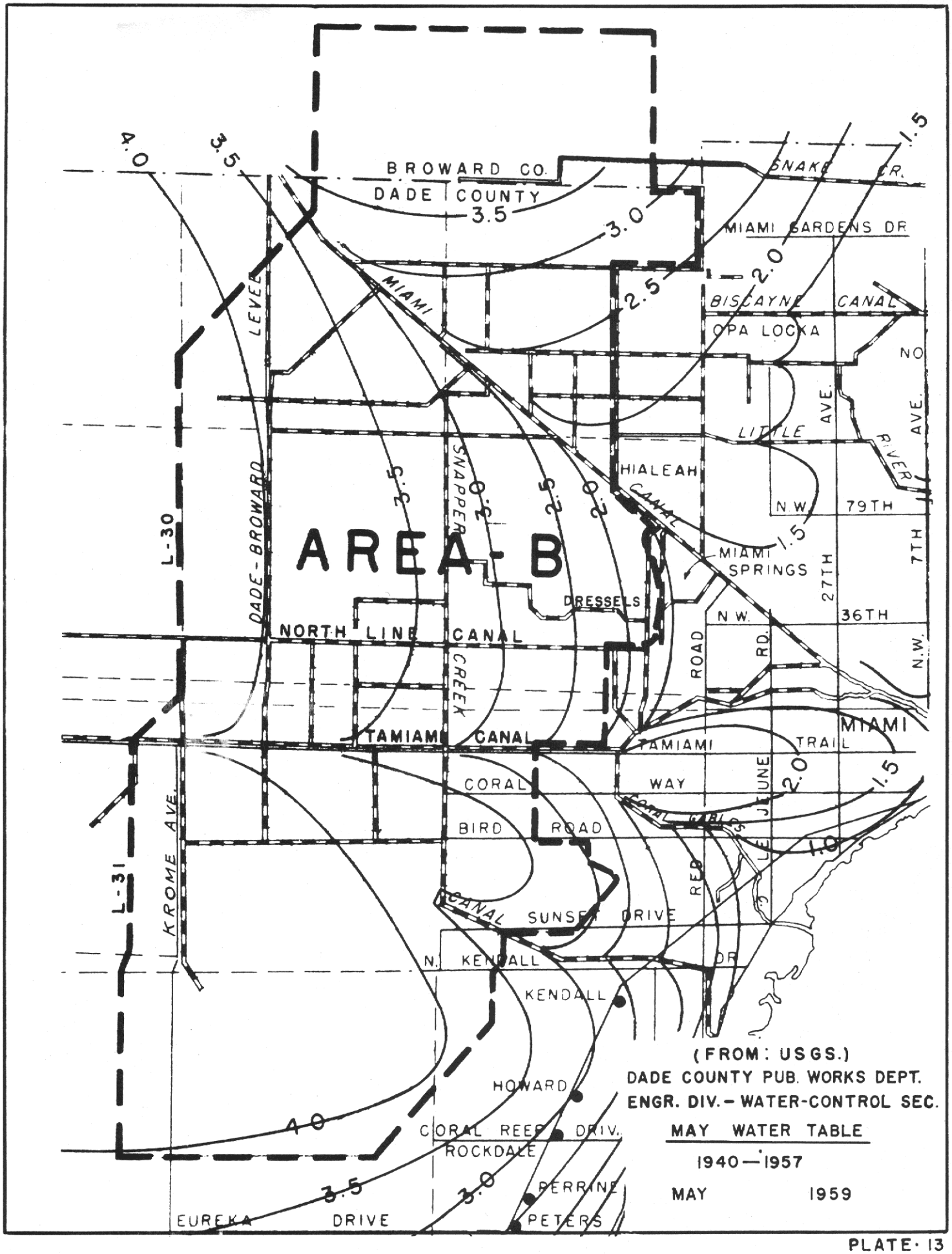


(FROM: USGS)

DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV.--WATER-CONTROL SEC.

AVERAGE WATER TABLE
1940 – 1957
MAY 1959

PLATE-12



(FROM: USGS.)
DADE COUNTY PUB. WORKS DEPT.
ENGR. DIV. – WATER-CONTROL SEC.

MAY WATER TABLE

1940 — 1957

MAY 1959

PLATE · 13

APPENDIX C

Bibliography for the Special Report on Area B,
Dade County, Central and Southern Florida Project.

1. House Document 643, 80th Congress, 2nd Session, title, "The Central and Southern Florida Project".

2. House Document 186, 85th Congress, 1st Session, title, "Local Cooperation in the Part of the Project Authorized by the Flood Control Act of 1954".

3. Senate Document 48, 85th Congress, 1st Session, title, "Hendry County, West of Levee 1, 2 and 3".

4. Survey-review report on Central and Southern Florida Project, Greater Miami Area (Area B), Corps of Engineers, Jacksonville, Florida, July 9, 1958.

5. House Report No. 1894, 85th Congress, 2nd Session, Report of the Committee on Public Works on HR 12955, the Flood Control Act of July 3, 1958.

6. Senate Report No. 1710, 85th Congress, 2nd Session, Report of the Committee on Public Works on S3910, the Flood Control Act of July 3, 1958.

7. Flood Control District report, "Recommended Plan of Major Facilities for Greater Miami Area to be Provided by Central and Southern Florida Project for Flood Control and Allied Purposes, "June 1952.

8. Bureau of the Budget Circular A-47, dated December 31, 1952.

9. Hearings before the Committee on Interior and Insular Affairs, House of Representatives, 84th Congress, 1st Session, March 15, and March 30, 1955.

10. Joint Hearings before the Committee on Interior and Insular Affairs and the Committee on Public Works, United States Senate, 84th Congress, 2nd Session, on Senate Resolution 281.

11. The Annual Report of the Chief of Engineers.

12. Numerous Congressional documents which are referred to by number in the text of the report.

13. Various hearings before House and Senate Committees on Public Works and Appropriations.