TECHNICAL MEMORANDUM

AN ATLAS OF ST. LUCIE COUNTY SURFACE WATER MANAGEMENT BASINS

By

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Water Resources Division
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AN ATLAS OF ST. LUCIE COUNTY SURFACE WATER MANAGEMENT BASINS

EXECUTIVE SUMMARY

This atlas contains information about the surface water management basins in St. Lucie County, Florida. The South Florida Water Management District (District) and the U.S. Army Corps of Engineers (COE) have primary authority over water management in these basins. The District has sponsored publication of this atlas to make available up-to-date non-technical descriptions of the surface water management basins in St. Lucie County to District personnel, to local governments in St. Lucie County, and to other interested persons. Text, maps, and tables of information are used to define and locate basins within the county. Canals, levees, and control structures within each basin and under the management of the District or the COE are located and are described and discussed with regard to their operation and management.

The surface water management basins of St. Lucie County were first delineated in the 1950's by the COE in their General Design Memorandum (GDM) for the Central and Southern Florida Flood Control Project (Project). Based on the hydrology of the basins, the COE designed and constructed a system of canals, levees, and control structures to provide flood protection for southern and central Florida. The Project is dynamic, with new works being constructed and old ones being modified to meet the changing needs of southern Florida. Most of the works constructed under the Project are now under the management of the District.

Five basins are described: the C-25, C-24, C-23, the North Fork of the St. Lucie River, and the C-59 basins.

The Project canals in St. Lucie County serve a variety of functions. The primary function of all the canals is to provide flood protection for the basins in which they are located. Secondary uses of the canals include land drainage for agriculture and urban or residential development and regulation of groundwater table elevations to prevent intrusion of saltwater into local groundwater. Most of the canals supply water for irrigation during periods of low natural flow.

The Project control structures in St. Lucie County regulate the flow of water in the canals. In general they are used to discharge excess water from the basins during flooding and to maintain minimum water levels in the canals during drought periods. Some structures are usually closed to prevent water from passing from one basin to another, but can be opened to supply water from one basin or canal to another as necessary. The coastal structures have the additional function of preventing saltwater from a tidal or storm surge from entering those canals discharging to tidewater.

A bibliography is included with the atlas. It lists publications concerning hydrology and hydraulics, water use, water quality, and land use in St. Lucie County. For the reader unfamiliar with some of the concepts and words used in these descriptions, the appendices contain a discussion of basic hydrologic and hydraulic concepts, and a glossary of terms.

SUMMARY INFORMATION

Basin	CSFFCP[1] Canals	CSFFCP[1] Control Structures	Design Level of Flood Protection	Primary Uses
C-25	•C-25 •C-25 South Leg •C-25 Extension	S-50 S-99 G-81	30% SPF[2] (1-10 Year)	• Flood protection • Drainage • Water supply • Control saltwater intrusion into local groundwater
C-24	•C-24 •C-23	S-49 G-78 G-79 G-81	30% SPF[2] (1-10 Year)	• Flood protection • Drainage • Water supply • Control saltwater intrusion into local groundwater
C-23	•C-23	S-48 S-97 G-78	30% SPF[2] (1-10 Year)	• Flood protection • Drainage • Water supply • Control saltwater intrusion into local groundwater
North Fork St. Lucie	•C-23A •C-24	S-49	30% SPF[2] (1-10 Year)	• Flood protection • Drainage
C-59 (Taylor Creek-Nubbin Slough	•C-59 •L-63S/L-64 Borrow Canal •L-63N Borrow Canal	S-191 S-192 G-106	30% SPF[2] (1-10 Year)	• Flood protection • Drainage • Water supply

[1]Central and Southern Florida Flood Control Project
[2]Standard Project Flood

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ABSTRACT

An atlas of the surface water management basins of St. Lucie County is presented. Five basins are described by text, maps, and tables of information. For each basin the canals and control structures of the Central and Southern Flood Control Project located within that basin are described and are discussed with regard to their operation and management. The 9 canals and 11 control structures discussed provide flood protection to 453 square miles of St. Lucie County. The design level of flood protection for all of the basins is 30 percent of the Standard Project Flood (SPF). In addition to flood protection, the canals and control structures provide drainage, contribute to agricultural water supply, provide navigable waterways, and in the case of the coastal structures, provide protection from saltwater intrusion into groundwater.

AN ATLAS OF ST. LUCIE COUNTY SURFACE WATER MANAGEMENT BASINS

INTRODUCTION

This atlas contains information about the surface water management basins in St. Lucie County, Florida. The South Florida Water Management District (District) and the U.S. Army Corps of Engineers (COE) have primary authority over water management in these basins. The District has sponsored publication of this atlas to make available up-to-date non-technical descriptions of the surface water management basins in St. Lucie County to District personnel, to local governments in St. Lucie County, and to other interested persons. Text, maps, and tables of information are used to define and locate basins within the county. Canals, levees, and control structures within each basin and under the management of the District or the COE are located and are described and discussed with regard to their operation and management.

The surface water management basins of St. Lucie County were first delineated in the 1950's by the COE in their General Design Memorandum (GDM) for the Central and Southern Florida Flood Control Project (Project). Presented in the GDM were the COE's analysis of the hydrology of each basin and an assessment of the flood risk for a storm of specified intensity and duration. Based on the hydrology of the basins, the COE designed a system of canals, levees, and control structures to provide some desired level of flood protection for each basin. Designs of these works were presented in the GDM and in the Detailed Design Memorandum for the Project. Most of the works constructed under the Project are now under the management of the District.

The Project is dynamic. As the population in South Florida has grown, and as land use and water demands have changed, the Project has evolved in response to these changes. Some parts of the original Project were never built, other parts have been rebuilt or modified, and as the need has arisen, new structures have been designed and constructed. In some cases, the basins themselves have been redefined. As the COE cannot always participate in construction of new works, the District has occasionally assumed responsibility for the design and construction of additions or modifications to the Project.

This atlas describes the five surface water management basins in St. Lucie County, Florida, and the Project works associated with each.

Following the basin descriptions is a bibliography of publications related to the surface water management basins in St. Lucie County. A variety of subjects are included: hydrology, hydraulics of canals and structures, water use, water quality, and land use. Included under hydrology and hydraulics are publications describing various statistical and mathematical models used by the District to predict rainfall, runoff, and canal flow.

Although the basin descriptions are not technical, the reader unfamiliar with the hydrology of lands within the county and with basic water resources engineering may need some words and concepts defined. Where this is the case, the reader is referred to the appendices. Appendix 1 is a discussion of the important

concepts with which the reader should be familiar to understand the basin descriptions. Appendix 2 is a glossary of terms, abbreviations, and acronyms used in these descriptions. Also defined in the glossary are the District's designations for the various Project and District works: canals, levees, and control structures.

Using the Basin Descriptions

Surface water management basins (hereafter drainage basins) in St. Lucie County are identified by the same designation as the major Project canal located in that basin. For example, C-24 is a canal draining central St. Lucie County. The drainage basin is named the C-24 basin. The exception to this rule in St. Lucie County is the North Fork of the St. Lucie River basin which is named for the major natural water channel in the basin although there is a short Project canal, C-23A, in the basin. In some cases, a canal also has a common name by which it is known. For example, C-25 is known as the Belcher Canal. The common name is given parenthetically in the chapter titles following the Project designation for the canal.

The drainage basins in St. Lucie County are shown in Figure 1. Map A (folded and placed in the pocket of the flyleaf) is a large map showing the basin boundary, canals, levees, and control structures relative to local roads and landmarks. This map should be referenced to precisely locate basin boundaries and District and Project works within the county. Drainage basins that do not have Project works located within their boundaries are not discussed in this atlas.

Each description contains three parts. The first part is a written discussion of the basin and is divided into two sections. The first section, **Description of the Basin**, provides a general description of the basin and its Project and District works: the drainage area; the general location of the basin within the county; the purpose and general operation of canals in the basin; the alignment of and direction of water flow in these canals; the location of inlets and outlets to the canals; and the location, purpose, and operation of structures controlling flow in the canals. The second section, **Comments on Design and Historic Operation**, provides commentary on a variety of topics related to the basin: the design storm (see **Design Storm** under **BASIC CONCEPTS**); significant changes to the basin and its works (e.g., urban development or enlargement of a canal) since the GDM was written, particularly with regard to any changes in flood protection for the basin; and proposals under consideration to redefine the basin or to modify any canals or control structures.

The second part of each basin description is a set of two maps. The first map locates the basin relative to other basins in St. Lucie County. The second map is a schematic drawing of the basin and its canals and control structures. It is intended that these maps should be used in conjunction with the written descriptions to understand the layout and operation of canals and structures in the basin. Major roads and landmarks are included on the schematic maps to help the reader locate the basin within the county. Precise location of canals or structures within the basin can be obtained by reference to Map A.

The third part of each basin description is a table presenting information about Project and District control structures (see **Control Structures** under **BASIC CONCEPTS**) located in the basin. The tables provide a physical description of each structure: type of structure, method of controlling water flow, and pertinent dimensions or elevations. Where a structure has been designed to pass a certain discharge under specified conditions of upstream and downstream water levels, this

information is included as the design discharge, design headwater stage, and design tailwater stage, respectively. The specified discharge is generally the flood discharge expected to pass the structure for the design storm (see **Design Storm** under **BASIC CONCEPTS**). In some cases, however, the design discharge may refer to water passed through the structure to supply downstream users or to maintain a specified water level in a canal downstream. If a structure was designed to be used to maintain a specified upstream water level under normal non-flooding conditions, this information is included as the optimum headwater stage. Peak water levels upstream and downstream of the structures, and peak discharges through the structures, are also given for those structures where this information has been recorded. Other information about the structures may be given if relevant.

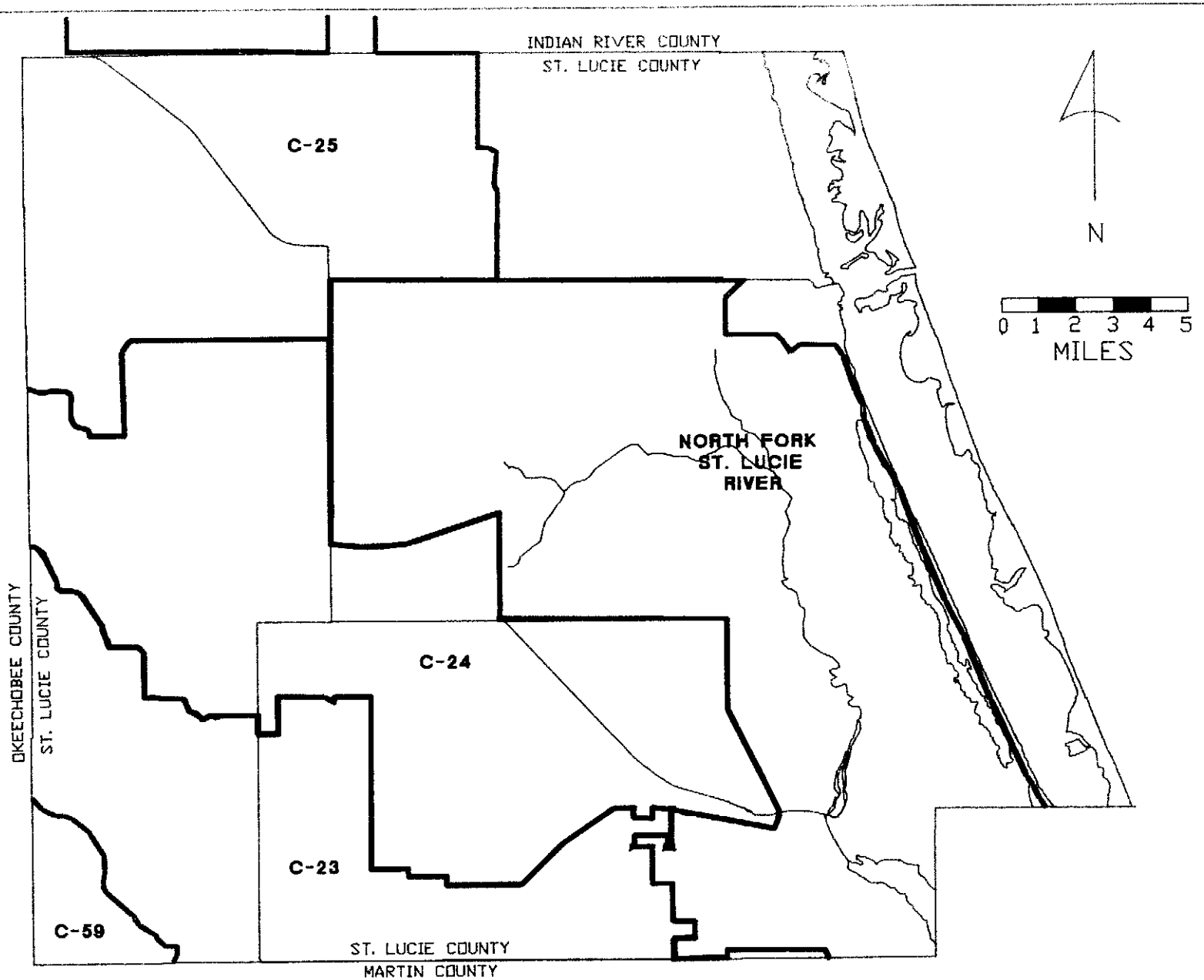

FIGURE 1. ST. LUCIE COUNTY DRAINAGE BASINS

C-25 (BELCHER CANAL) BASIN

Description of the Basin

The C-25 basin is approximately 164.8 square miles in area and is located in northwest St. Lucie County (41.8 square miles, Figure 2), eastern Okeechobee County (117.0 square miles), and southern Indian River County (6.0 square miles). The basin boundary in St. Lucie County relative to local roads and landmarks is shown on Map A. A schematic map showing the basin boundary, canals, and control structures for the C-25 basin is given in Figure 3.

The Project canals and control structures in the C-25 basin have three functions: (1) to remove excess water from the C-25 basin, (2) to supply water to the C-25 basin and under some conditions to the C-24 basin, and (3) to maintain a groundwater table elevation west of S-50 adequate to prevent intrusion of salt water into local groundwater. Excess water may be discharged from the basin to tidewater by way of S-99 and S-50, or to the C-24 basin by way of G-81. Water surface elevations in C-25 are regulated by S-50 and S-99. In general the only water supply to the C-25 basin is from local rainfall and from pumping of groundwater from the Floridan Aquifer.

There are three Project canals in the C-25 basin: C-25, C-25 South Leg, and the C-25 Extension.

C-25 is aligned east-west, parallel to and 1.5 miles north of Orange Avenue from a point one mile east of Minute Maid Road to the Intracoastal Waterway. Flow in C-25 is to the east, with discharge to tidewater in the Intracoastal Waterway (Indian River) west of the Fort Pierce Inlet.

C-25 South Leg is aligned north-south, parallel to and 0.7 of a mile east of Minute Maid Road from Orange Avenue to C-25. At its north end, C-25 South Leg makes an open channel connection with the west end of C-25. At its south end, C-25 South Leg is connected to C-24 by way of the divide structure G-81. Flow in C-25 South Leg is to the north to C-25.

The C-25 Extension parallels Florida's Turnpike from a point about 1.5 miles west of Minute Maid Road to a point about 0.7 of a mile east of Minute Maid Road. There the canal turns to the south, paralleling Minute Maid Road to the confluence of C-25 and C-25 South Leg. The confluence of C-25, the C-25 Extension, and C-25 South Leg is about 1.5 miles north of Orange Avenue. Flow in the C-25 Extension is to the south to C-25.

There are two non-Project canals serving the western C-25 basin that are of interest: the Turnpike canal and the Orange Avenue borrow canal. These canals provide flood protection and drainage to the western part of the basin. They are tributary to Project canals in the basin. The Turnpike canal is aligned parallel to and just south of Florida's Turnpike. It is continuous with the C-25 Extension and extends eight miles to the west along the Turnpike. The Orange Avenue borrow canal is aligned parallel to and just north of Orange Avenue. At its east end, the Orange Avenue borrow canal makes an open channel connection with C-25 South Leg. The Orange Avenue borrow canal extends seven miles to the west along Orange Avenue.

There are three Project control structures regulating flow in the C-25 basin: S-50, S-99, and G-81. Design criteria for the structures in this basin are given in Table 1.

S-50 is a fixed crest weir located in the alignment of C-25 near U.S. Highway 1. If flow in the canal is adequate, the weir maintains a stage greater than 12.0 ft NGVD in the lower reach of C-25, adequate to prevent saltwater intrusion to local groundwater.

S-99 is a gated spillway located in the alignment of C-25 at Godwin Road. It controls water surface elevations in the upper reach of C-25, and it controls discharge to the lower reach of C-25. When there is sufficient water, the structure is operated to maintain a headwater stage between 19.2 and 20.2 ft NGVD during the wet season (i.e., May 15 to October 15) and between 21.5 and 22.5 during the dry season (i.e., October 15 to May 15).

G-81 is a steel sheet-pile dam with a gated weir. It is located in the alignment of C-24 at Orange Avenue. The structure is normally closed, and functions as a divide between the C-24 and C-25 basins (i.e., C-24 and C-25 South Leg). Normal flows north of the structure are to the north, and normal flows south of the structure are to the south. G-81 can be opened for two reasons: (1) to supply water from the C-25 basin to the C-24 basin during the dry season when the stage in C-24 at S-49 is below optimum (see Table 2) and is more than 1.5 feet lower than the stage in C-25 at S-99; and (2) to pass flood discharges from one basin to the other if additional flows will not create a flood condition in the receiving basin. This structure does not have a design flood discharge. Uncontrolled flow from one basin to the other occurs when the stage on either side of the structure exceeds the crest elevation of 23.0 ft NGVD.

Comments on Design and Historic Operation

C-25 and S-99 were designed to pass thirty percent of the Standard Project Flood, and to meet irrigation delivery requirements for the basin. However, much of the western part of the basin has almost no flood protection. Landowners in the area rely on on-site retention for flood protection and drainage.

With District approval, two areas in the North Fork St. Lucie basin can be pumped to C-25 to mitigate flooding in the North Fork St. Lucie basin: (1) an eighteen square mile parcel in the northwest corner of the North Fork St. Lucie basin which normally drains to Ten Mile Creek by gravity flow; and (2) a three square mile parcel in the northeast corner of the North Fork St. Lucie basin which normally drains to Five Mile Creek by gravity flow.

Water can be diverted from C-25 to the Fort Pierce Farms Drainage District for irrigation during the dry season. The Fort Pierce Farms Drainage District drains by gravity flow to C-25 below S-50 (i.e., to tidewater).

There are a large number of citrus growers in the basin, and the demand for water is high. At the present time, the only source of water is local rainfall and artesian-well water from the Floridan Aquifer. This well water has a high mineral content and is generally mixed with surface water before it is used as irrigation water. In order to have an equitable distribution of the available surface water supply, the inverts of irrigation supply culverts and irrigation pump intakes are limited to a minimum elevation of 14.0 ft NGVD.

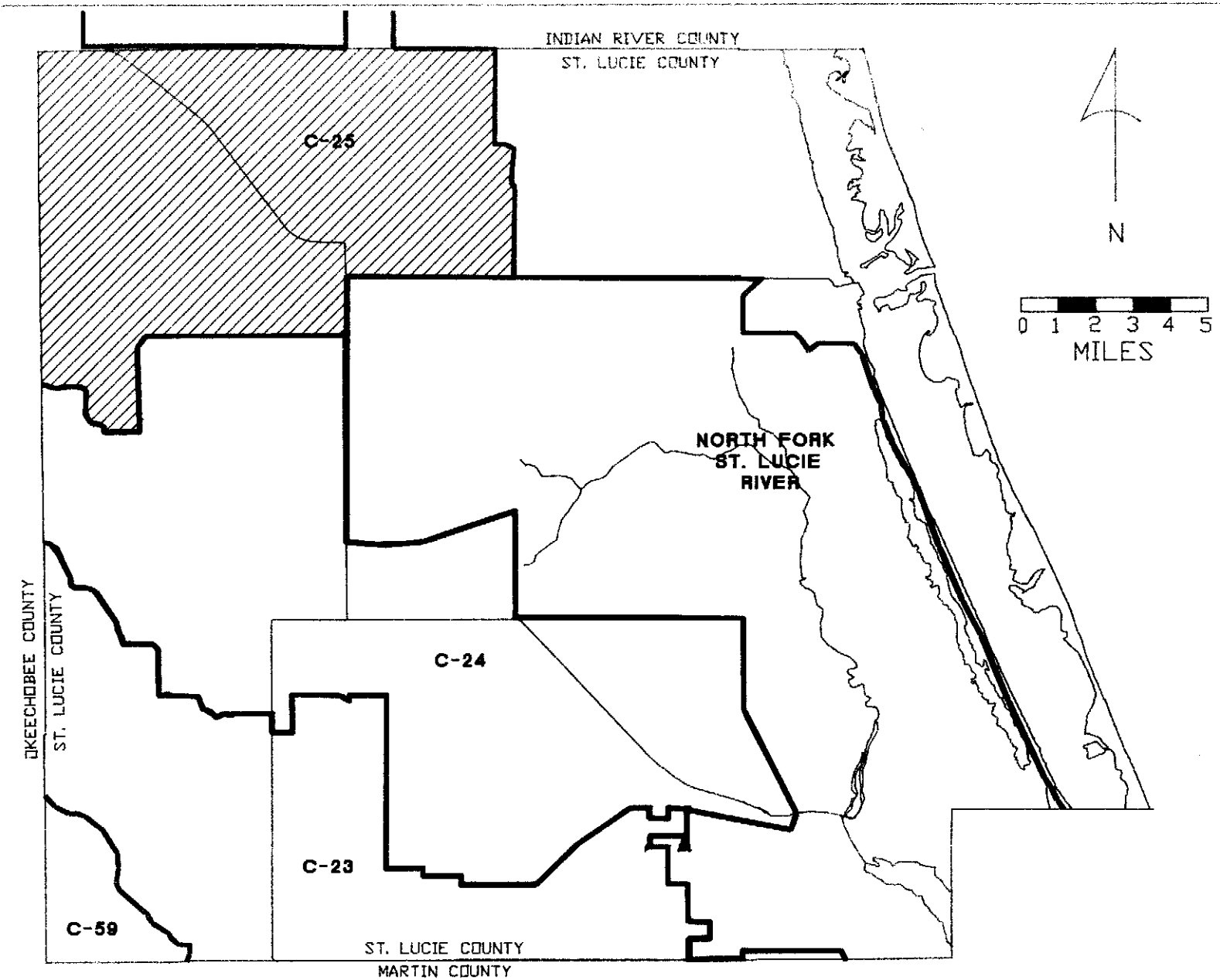

FIGURE 2. C-25 BASIN LOCATION MAP

C-25 BASIN

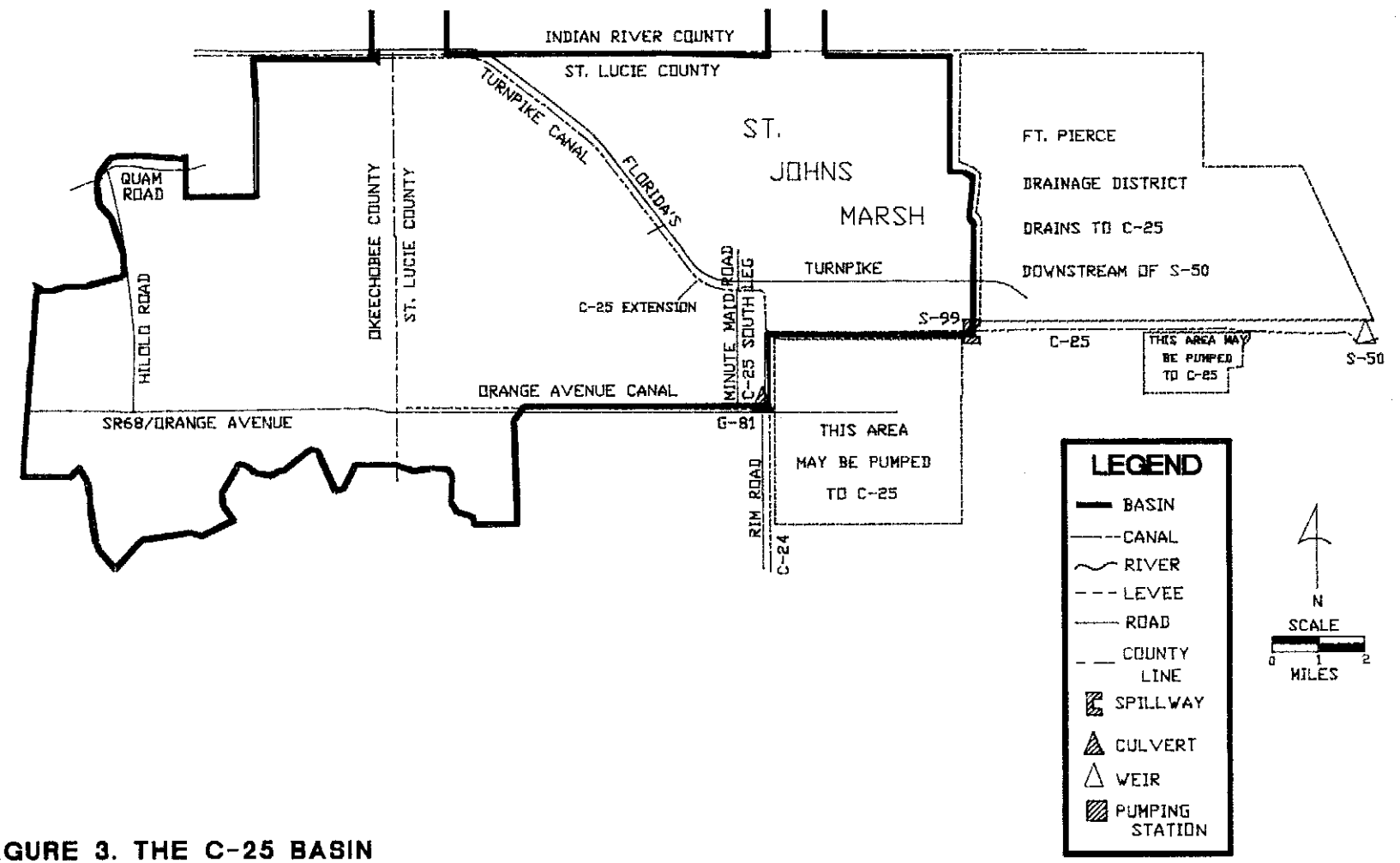

FIGURE 3. THE C-25 BASIN

TABLE 1. C-25 Basin Structures - Design Criteria

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)	Peak Stage (ft NGVD) Peak Discharge (cfs)	Date of Peak
S-50 Stage divide	Fixed Crest Weir Crest lgth = 126ft Crest elev = 12.0ft NGVD	16.0	0.7	Passes flow when HW > 12.0	3800		
S-99 Stage Divide	Gated Spillway, 2 gates 15.4 ft highx 25.8ft wide Net crest lgth = 50.0ft Crest elev = 5.6ft NGVD	20.0	19.5	May15 to Oct 15, 19.2 ≤ HW ≤ 20.2 Oct15 to May 15, 21.5 ≤ HW ≤ 22.5	3860	HW = 23.40 Q = 2709	6/15/86 8/28/64
G-81 (Orange Ave. Structure) Water Supply fromC-25 to C-24 Flood Discharges from C-25 to C-24 or from C-24 to C-25	Steel Sheet-Pile Dam, 3-timber gates on concrete weir, 9.5ft high x 5.7 ft wide Net crest lgth = 15.0ft Crest elev = 13.5ft NGVD			Depends on Conditions			

in = inches
ft = feet
elev = elevation

lgth = Length
TW = Tail water
Q = discharge in cfs

CMP = Corrugated metal pipe
RCP = Reinforced concrete pipe
ft NGVD = Feet relative to National Geodetic Vertical Datum

HW = Head water
CFS = Cubic feet per second

ds = downstream
ups = upstream

C-24 (DIVERSION CANAL-RIM DITCH CANAL) BASIN

Description of the Basin

The C-24 basin is approximately 166.6 square miles in area and is located in central St. Lucie County (139.0 square miles, Figure 4) and east-central Okeechobee County (27.6 square miles). The basin boundary in St. Lucie County relative to local roads and landmarks is shown on Map A. A schematic map showing the basin boundary, canals, and control structures for the C-24 basin is given in Figure 5.

The Project canals and control structures in the C-24 basin have three functions: (1) to remove excess water from the C-24 basin, (2) to supply water to the basin, and (3) to maintain a groundwater table elevation west of S-49 adequate to prevent intrusion of salt water into local groundwater. Excess water may be discharged from the basin to tidewater by way of S-49 or to the C-25 basin by way of G-81. Water surface elevations in C-24 are regulated by S-49. In general the only water supply to the C-24 basin is from local rainfall and from pumping of groundwater from the Floridan Aquifer, but, if available, water can be supplied to the basin from the C-23 basin by way of G-78 or from the C-25 basin by way of G-81.

There are two Project canals in the C-24 basin: C-24 and a portion of C-23.

C-24 comprises two canals: the Rim Ditch Canal and the Diversion Canal. The Rim Ditch Canal is that section of C-24 aligned north-south, parallel to and west of Rim Road. At its north end, the Rim Ditch Canal is connected to C-25 South Leg by way of the divide structure G-81. At its south end, the Rim Ditch Canal is connected to C-23 by way of G-79 and to the Diversion Canal by an open channel. The confluence of the Rim Ditch Canal and C-25 South Leg is at Orange Avenue, and the confluence of the Rim Ditch Canal, Diversion Canal, and C-23 is two miles south of State Road 70. Flow in the Rim Ditch Canal is usually to the south. If G-81 is opened to discharge water to the C-25 basin, flow in the Rim Ditch Canal may be to the north. The Diversion Canal is aligned east-west and extends from its intersection with the Rim Ditch Canal on the west to Shinn Road on the east. From Shinn Road to the North Fork of the St. Lucie River, the Diversion Canal is aligned northwest to southeast. Flow in the Diversion Canal is to the east with discharge to tidewater in the North Fork of the St. Lucie River just south of the town of Port St. Lucie.

The portion of C-23 in the C-24 basin extends two miles to the west from its confluence with C-24 and then three miles to the south to Germany Canal Road. C-23 enters the C-23 basin at Germany Canal Road by way of G-78. Water surface elevations in this section of C-23 are maintained at a higher level than in C-24. G-79 controls water surface elevations in this section. Flow of water in this part of C-23 is to the north to C-24.

There are four Project control structures regulating flow in the C-24 basin: S-49, G-78, G-79, and G-81. Design criteria for the structures in the basin are given in Table 2.

S-49 is a gated spillway located in the alignment of C-24 one mile west of Florida's Turnpike. It controls the water surface elevations in C-24, and it controls the discharge from C-24 to tide water. When flow in the canal is adequate, a

headwater stage is maintained by S-49 adequate to prevent salt water intrusion to local groundwater. During the wet season (i.e., May 15 to October 15), the headwater stage at S-49 is maintained between 18.5 and 20.2 ft. NGVD, and during the dry season (i.e., October 15 to May 15), the headwater stage is maintained between 19.5 and 21.2 ft NGVD if flow in the canal is adequate.

G-78 is a gated culvert located in the alignment of C-23 at the end of Germany Canal Road, 3.6 miles southwest of the confluence of C-23 and C-24. Control of water flow is by riser and flashboards. The flashboards are normally all in place, and the structure functions as a divide between the C-23 and C-24 basins. Under normal conditions the section of C-23 north of G-78 is in the C-24 basin with flows to the north to C-24. Normal flows in C-23 south of G-78 are to the south. G-78 can be opened for two reasons: (1) to discharge excess water from C-23 to C-24 during a storm event if C-24 has sufficient capacity to accept additional flows; and (2) to supply water during periods of low flow, from the C-23 basin to the C-24 basin when C-24 is below optimum and there is sufficient water in C-23. Although G-78 may occasionally be used to pass excess water from the C-23 to the C-24 basin, it was not designed to pass flood flows and is not considered to provide flood protection to the C-23.

G-79 is a culvert in the alignment of C-23 at the intersection of C-23 and C-24. Water flow is controlled by a riser and flashboards. The structure is operated as a weir to maintain relatively high stages in C-23 south to G-78. Water passed from C-23 through G-78 to C-24 are also passed through G-79. The flashboards are set at 21.0 ft. NGVD during the wet season and at 22.0 ft NGVD during the dry season. If the headwater (i.e., C-24 side) stage exceeds 23.0 ft NGVD, boards are pulled as necessary to maintain a maximum headwater stage of 23.0 ft NGVD.

G-81 is a steel sheet-pile dam with a gated weir. It is located in the alignment of C-24 at Orange Avenue. The structure is normally closed and functions as a divide between the C-24 and C-25 basins (i.e., C-24 and C-25 South Leg). Normal flows north of the structure are to the north, and normal flows south of the structure are to the south. G-81 can be opened for two reasons: (1) to supply water from the C-25 basin to the C-24 basin during the dry season when the stage in C-24 at S-49 is below optimum (see Table 2) and is more than 1.5 feet lower than the stage in C-25 at S-99; and (2) to pass flood discharges from one basin to the other if additional flows will not create a flood condition in the receiving basin. This structure does not have a design flood discharge. Uncontrolled flow from one basin to the other occurs when the stage on either side of the structure exceeds the crest elevation of 23.0 ft NGVD.

Comments on Design and Historic Operation

C-24 and S-49 were designed to pass thirty percent of the Standard Project Flood and to meet irrigation delivery requirements for the basin.

There are a large number of citrus growers in the basin, and the demand for water is high. At the present time, the only source of water is local rainfall and artesian-well water from the Floridan Aquifer. This well water has a high mineral content and is generally mixed with surface water before is used as irrigation water. In order to have an equitable distribution of the available surface water supply, the inverts of irrigation supply culverts and irrigation pump intakes are limited to a minimum elevation of 14.0 ft NGVD.

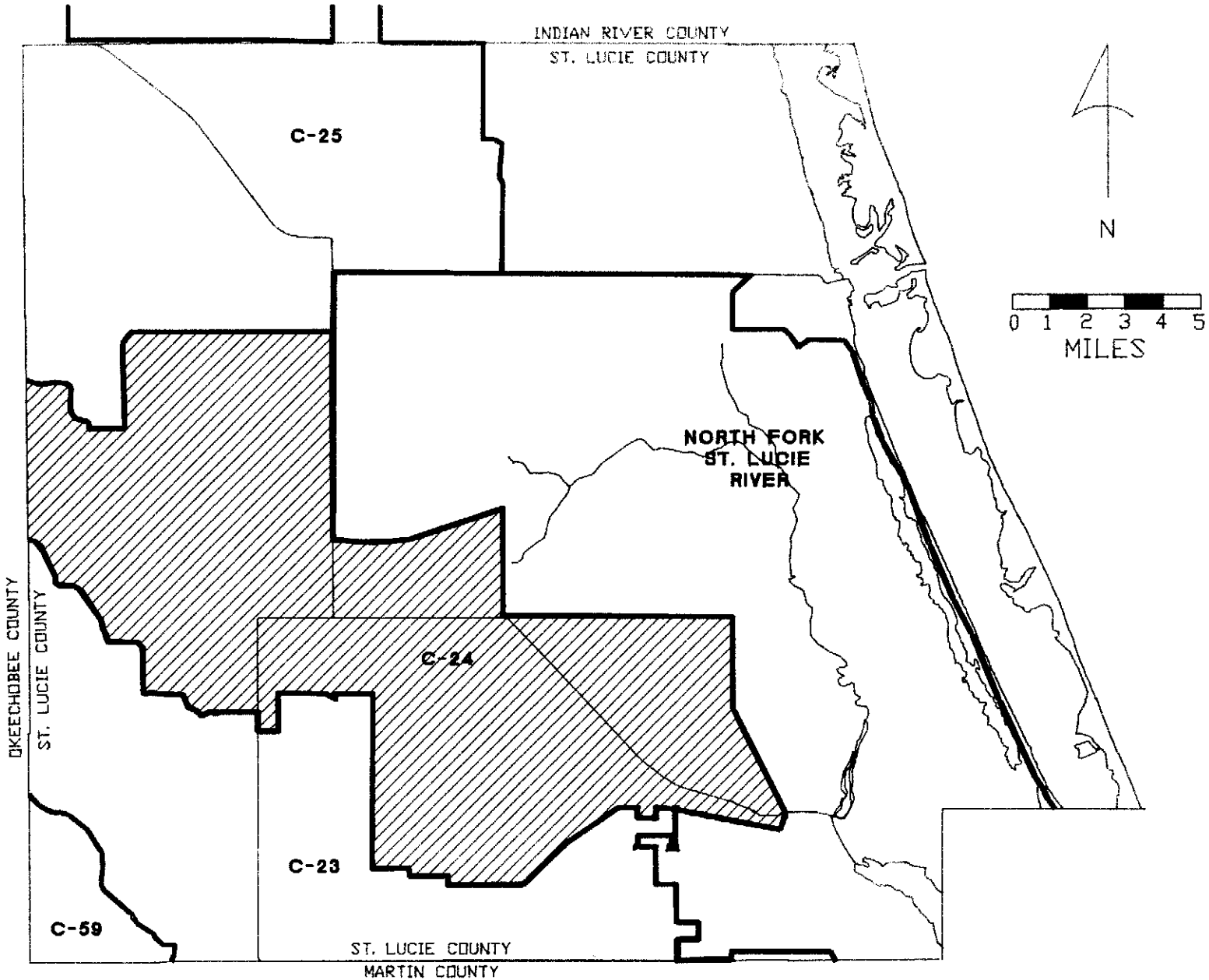

FIGURE 4. C-24 BASIN LOCATION MAP

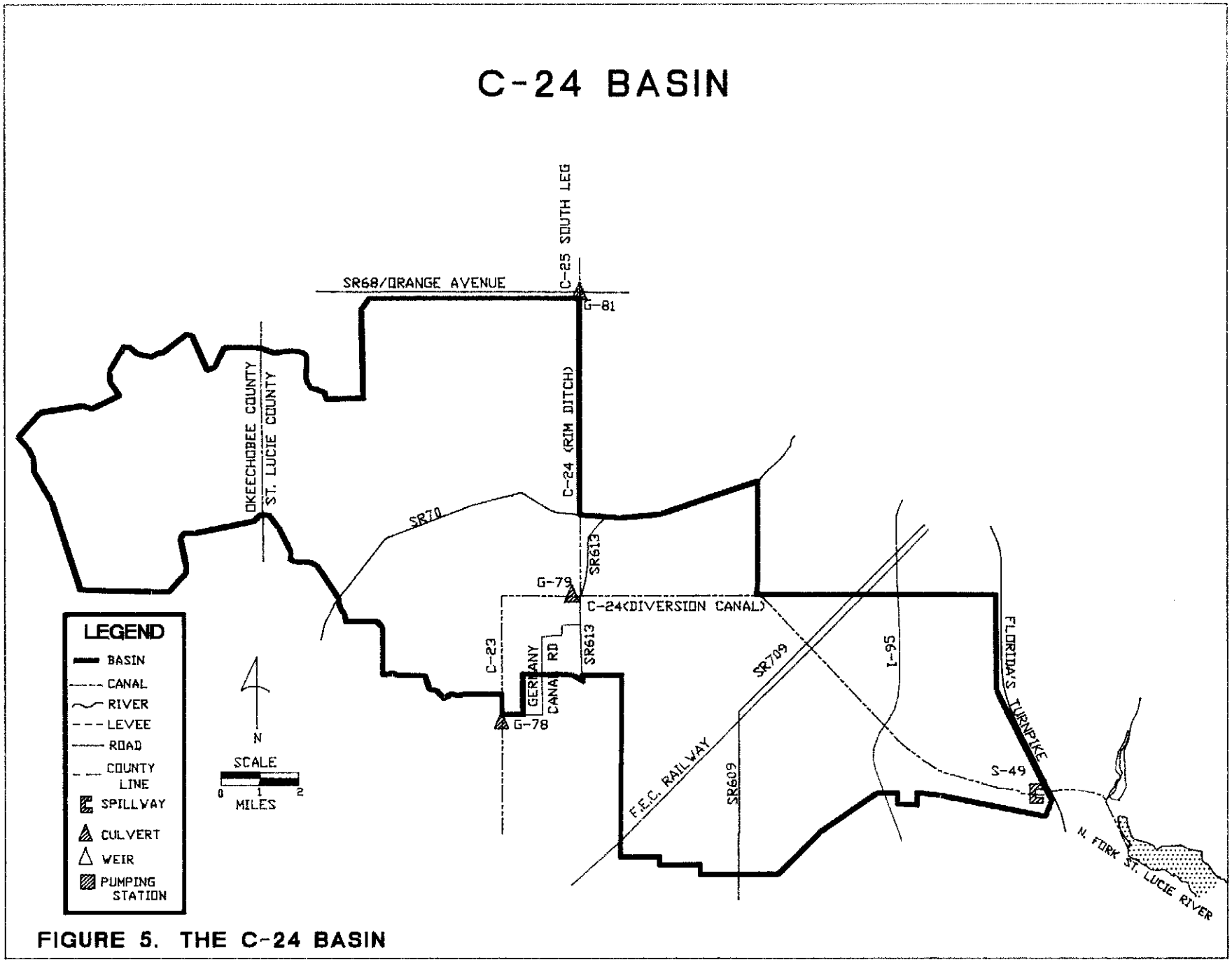

FIGURE 5. THE C-24 BASIN

TABLE 2. C-24 Basin Structures - Design Criteria

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)	Peak Stage (ft NGVD) Peak Discharge (cfs)	Date of Peak
S-49 Stage divide	Gated spillway, 2 gates, 15.7ft high x 17.8ft wide Net crest lgth = 34.0ft Crest elev = 4.4ft NGVD	16.3	2.4	May15 to Oct15 18.5 ≤ HW ≤ 20.2 Oct15 to May 15 19.5 ≤ HW ≤ 21.2	4680	HW = 22.39 Q = 3857	3/9/69 8/28/64
G-78 Divide Structure: C-23 and C-24 Basins Water Supply: C-23 to C-24	Culvert, Riser with flashboards 1-72in x 50ft CMP			Normally Closed, opened to supply water from C-23 to C-24			
G-79 (Carlton Road Structure) Stage divide Water Supply: C-23 to C-24	Culvert, Risers with flashboards 2-60in x 62ft CMP Invert. elev = 16.9ft NGVD (west end) Invert. elev = 15.9ft NGVD (east end) 1-84in x 62ft CMP Invert. elev = 15.1ft NGVD	22.0	22.9	HW < 23.0	195		
G-81 (Orange Ave. Structure) Water Supply from C-25 to C-24 Flood Discharges from C-25 to C-24 or from C-24 to C-25	Steel Sheet-Pile Dam, 3-timber gates on concrete weir, 9.5ft high x 5.7 ft wide Net crest lgth = 15.0ft Crest elev = 13.5ft NGVD			Depends on Conditions			

in = inches
ft = feet
elev = elevation

lgth = Length
TW = Tail water
Q = discharge in cfs

CMP = Corrugated metal pipe
RCP = Reinforced concrete pipe
ft NGVD = Feet relative to National Geodetic Vertical Datum

HW = Head water
CFS = Cubic feet per second

ds = downstream
ups = upstream

C-23 (COUNTY LINE CANAL) BASIN

Description of the Basin

The C-23 basin is approximately 167.7 square miles in area and is located in southwest St. Lucie County (82.7 square miles, Figure 6), eastern Okeechobee County (14.0 square miles), and northern Martin County (71.0 square miles). The basin boundary in St. Lucie County relative to local roads and landmarks is shown on Map A. A schematic map showing the basin boundary, canals, and control structures is given in Figure 7.

The Project canal and control structures in the C-23 basin have three functions: (1) to remove excess water from the C-23 basin, (2) to supply water to the C-23 basin and occasionally to the C-24 basin during periods of low natural flow, and (3) to maintain a groundwater table elevation west of S-48 adequate to prevent intrusion of saltwater into local groundwater. Excess water in the basin may be discharged to tidewater by way of S-97 and S-48, or occasionally, to the C-24 basin by way of G-78. Water surface elevations in C-23 are regulated by S-48 and S-97. In general, the only water supply to the C-23 basin is from local rainfall and from pumping of groundwater from the Floridan Aquifer.

C-23 is the only Project canal in the basin. Its northern most end is in the C-24 basin and connects to C-24 at State Road 613 (Carlton Road) two miles south of State Road 70. From State Road 613, C-23 extends to the west two miles and then to the south to the Martin-St. Lucie County line. C-23 enters the C-23 basin on this north-south leg at Germany Canal Road six miles north of the county line. Flow in C-23 is divided between the C-23 and C-24 basins at Germany Canal Road by the divide structure G-78. At the Martin-St. Lucie County line, the canal turns to the east to follow the county line to a point one mile east of Florida's Turnpike. The canal extends another 1.5 miles to the southeast discharging to tidewater in the North Fork of the St. Lucie River west of the City of Stuart. Normal flow of water in the north-south leg of C-23 south of G-78 is to the south, and flow of water in the east-west leg of C-23 is to the east. If water is being discharged to the C-24 basin for water supply or for flood control, flow of water in the north-south leg may be to the north.

There are three Project structures controlling flow in the C-23 basin: S-48, S-97 and G-78. Design criteria for the structures in this basin are given in Table 3.

S-48 is a fixed crest weir located at the outlet of C-23 to the North Fork of the St. Lucie River. If flow in the canal is adequate, the weir maintains a stage greater than 8.0 ft NGVD in the lower reach of C-23, adequate to prevent saltwater intrusion to local groundwater.

S-97 is a gated spillway located at the Florida's Turnpike crossing of C-23. It controls water surface elevations in the upper reach of C-23, and it regulates discharge to the lower reach of C-23. If flow in the canal is adequate, the structure is operated to maintain a headwater stage of between 20.5 and 22.2 ft NGVD during the wet season (i.e., May 15 to October 15) and between 22.2 and 23.2 ft NGVD during the dry season (i.e., October 15 to May 15).

G-78 is a gated culvert located in the alignment of C-23 at the end of Germany Canal Road, 3.6 miles southwest of where C-23 joins C-24. Control of water flow is

by riser and flashboards. All flashboards are normally in place and the structure functions as a divide between the C-23 and C-24 basins. G-78 can be opened for two reasons: (1) to discharge excess water from C-23 to C-24 during a storm event if C-24 has sufficient capacity to accept additional flows; and (2) during periods of low flow, to supply water from the C-23 basin to the C-24 basin when C-24 is below optimum and there is sufficient water in C-23. G-78 was not designed to pass flood discharges. Although G-78 may occasionally be used to pass excess water from the C-23 to the C-24 basin, it was not designed to pass flood flows and is not considered to provide flood protection to the C-23 basin.

Comments on Design and Historic Operation

C-23 and S-97 were designed to pass thirty percent of the Standard Project Flood and to meet irrigation delivery requirements for the basin.

There are a large number of citrus growers in the basin, and the demand for water is high. At the present time, the only source of water is local rainfall and artesian-well water from the Floridan Aquifer. This well water has a high mineral content and is generally mixed with surface water before it is used as irrigation water. In order to have an equitable distribution of the available surface water supply, the inverts of irrigation supply culverts and irrigation pump intakes are limited to a minimum elevation of 14.0 ft NGVD.

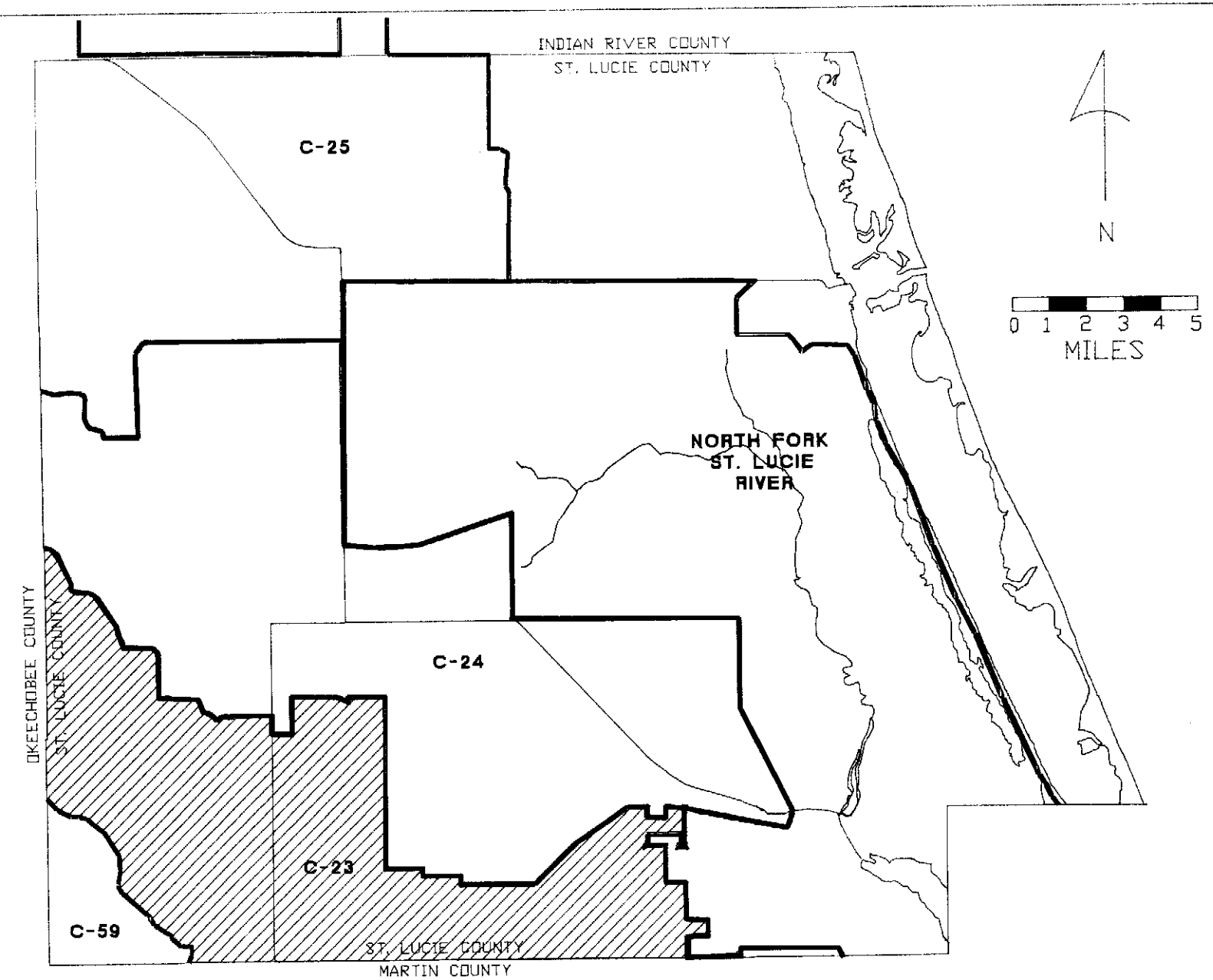

FIGURE 6. C-23 BASIN LOCATION MAP

C-23 BASIN

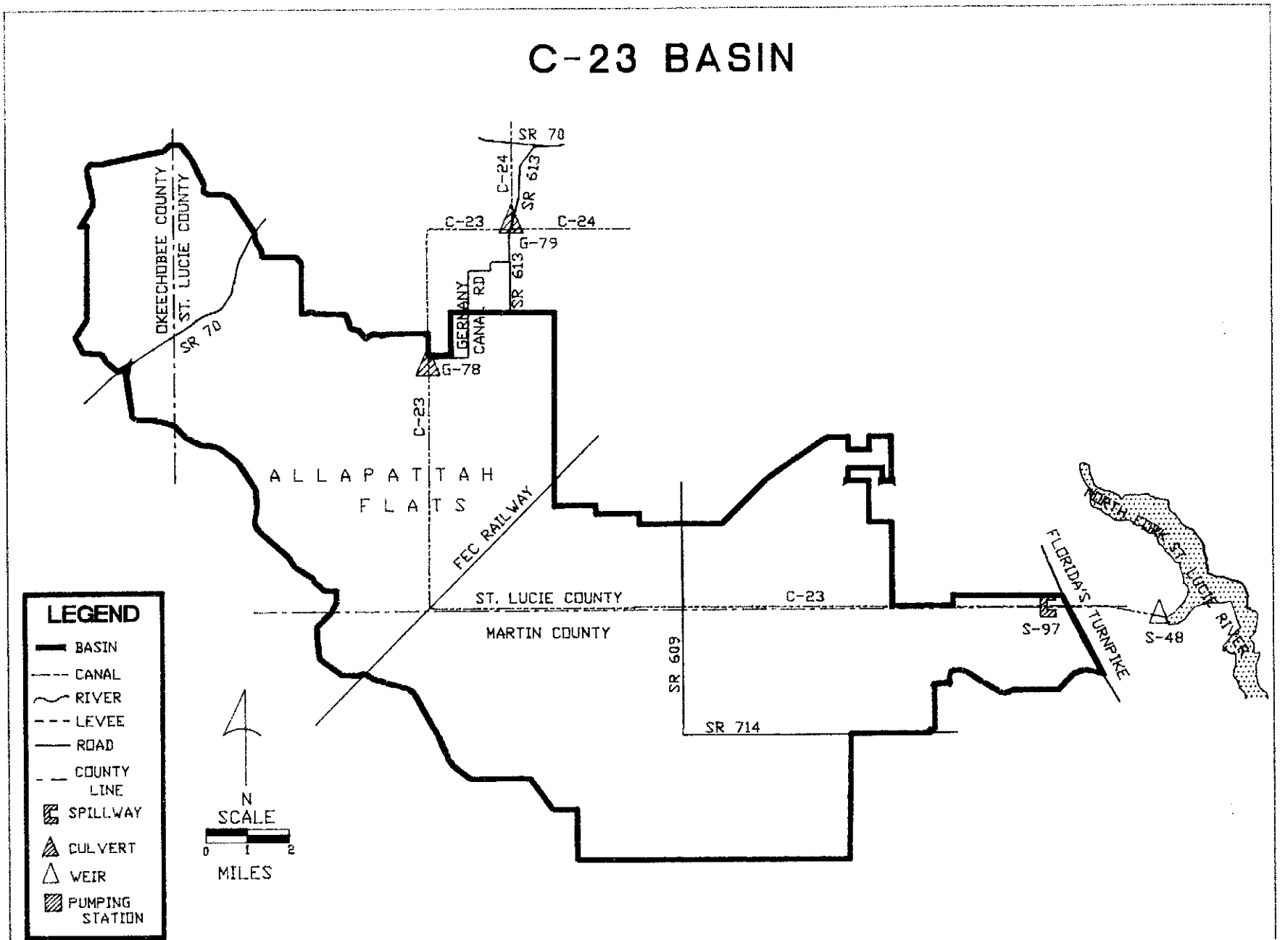

FIGURE 7. THE C-23 BASIN

TABLE 3. C-23 Basin Structures - Design Criteria

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)	Peak Stage (ft NGVD) Peak Discharge (cfs)	Date of Peak
S-48 Stage divide	Fixed crest weir Crest lgth = 113.0ft Crest elev = 8.0ft NGVD	13.0	0.7	Passes flow when HW>8.0	5035	Q = 3859	9/19/85
S-97 Stage Divide	Gated Spillway, 2 gates 14.2ft high x 22.8ft wide Net crest lgth = 44ft Crest elev = 7.8 ft NGVD	18.5	14.0	May15 to Oct15 20.5 ≤ HW ≤ 22.2 Oct15 to May 15 22.2 ≤ HW ≤ 23.2	5035	HW = 23.82 Q = 3859	10/02/67 9/19/85
G-78 Divide Structre, C-23 and C-24 basins	Culvert, 1-72in x 58ft CMP						

in = inches
ft = feet
elev = elevation

lgth = Length
TW = Tail water
Q = discharge in cfs

CMP = Corrugated metal pipe
RCP = Reinforced concrete pipe
ft NGVD = Feet relative to National Geodetic Vertical Datum

HW = Head water
CFS = Cubic feet per second

ds = downstream
ups = upstream

NORTH FORK OF THE ST. LUCIE RIVER BASIN

Description of the Basin

The North Fork of the St.Lucie River drainage basin is 191.6 square miles in area and is located in eastern St. Lucie County (180.7 square miles, Figure 8) and northeastern Martin County (10.9 square miles). The basin boundary in St. Lucie County is shown on Map A. A schematic map showing the basin boundary, canals, control structures, and tributary streams is given in Figure 9.

The Project canals and control structure in the North Fork of the St. Lucie River basin remove excess water from the North Fork of the St. Lucie River basin and from the C-24 basin. Discharge of water into the North Fork of the St. Lucie River basin from the C-24 basin is controlled by S-49.

There are two Project canals in the North Fork of the St. Lucie River basin. C-23A is a short section of canal in the lower reach of the North Fork of the St. Lucie River. C-23A passes discharges from the North Fork of the St. Lucie River and from C-24 to the St. Lucie estuary. A short reach of the C-24 canal extends from S-49 one mile west of Florida's Turnpike to the North Fork of the St. Lucie River just north of C-23A. This reach of C-24 has no control and is tidal.

S-49 is the only Project control structure regulating flow in the North Fork of the St. Lucie River basin. S-49 is a gated spillway located in the alignment of C-24 one mile west of Florida's Turnpike. It controls the water surface elevations in C-24 (in the C-24 basin), and it controls the discharge from C-24 to tide water (in the North Fork of the St. Lucie River basin). A headwater stage is maintained by S-49 adequate to prevent salt water intrusion to local groundwater. Specifically, S-49 is operated to maintain a headwater stage of between 18.5 and 20.2 ft NGVD during the wet season (i.e., May 15 to October 15) and between 19.5 and 21.2 during the dry season (i.e., October 15 to May 15).

Comments on Design and Historic Operation

C-23A was designed to pass thirty percent of the Standard Project flood from the North Fork of the St. Lucie River basin and from the C-24 basin.

With District approval, two areas in the North Fork St. Lucie River basin can be pumped to C-25 to mitigate flooding in the North Fork St. Lucie River basin: (1) an eighteen square mile parcel in the northwest corner of the North Fork St. Lucie River basin which normally drains to Ten Mile Creek by gravity flow, and (2) a three square mile parcel in the northeast corner of the North Fork St. Lucie River basin which normally drains to Five Mile Creek by gravity flow.

The District and the COE are currently (1988) investigating plans to reduce deposition of sediments in the St. Lucie Estuary. There are two significant problems:

1. Deposition of coarse, sandy sediments at the outlet of C-44A to the South Fork of the St. Lucie River creates shoals that restrict flow and are a hazard to navigation.

2. Deposition of fine clays and organic materials elsewhere in the estuary may create environmental problems. In some cases, the fine materials promote anaerobic conditions on the estuary bottom, an unsuitable environment for the organisms typically inhabiting the estuary. Additionally, these fine materials may contain high concentrations of toxic materials (e.g., heavy metals and pesticides).

The sediments involved in these depositions result in part from scouring of canal banks upstream along C-44. Continuous scour in some areas has widened the canal to the extent that purchase of additional right-of-way has been required. It is believed that C-44A, the tributaries to both C-44 and C-44A, and Lake Okeechobee are also sources of sediments, but the relative contributions of these sources has not yet been determined.

Several alternative plans have been suggested: (1) installation of rip-rap and other structural materials along the banks of the canal, (2) stabilization of the canal banks through sloping and revegetation, (3) construction of a large settlement basin, and (4) continuation of the current practice of periodic dredging of the estuary. The COE is preparing a draft General Design Memorandum which will describe the various options and make recommendations for future work.

The District, the COE, the U. S. Department of Agriculture, the Martin County Soil and Water Conservation District have sponsored a demonstration project to evaluate the use of various structural materials and vegetation to stabilize the canal banks. Three sites were chosen for study: Site 1 is located just upstream of S-80 and is subjected to lowered water levels and high water velocities during regulatory discharges. This site was stabilized with large rocks placed at or below the waterline and various types of plants placed above the waterline. Site 2 is located midway between S-80 and S-308 near Indiantown. Little fluctuation in water levels occurs at this site during regulatory releases. It was stabilized with vegetation. Site 3 is located just downstream of S-308 in an area subjected to higher water levels and high water velocities during regulatory releases. This site was stabilized with various types of structural materials placed at and above the waterline.

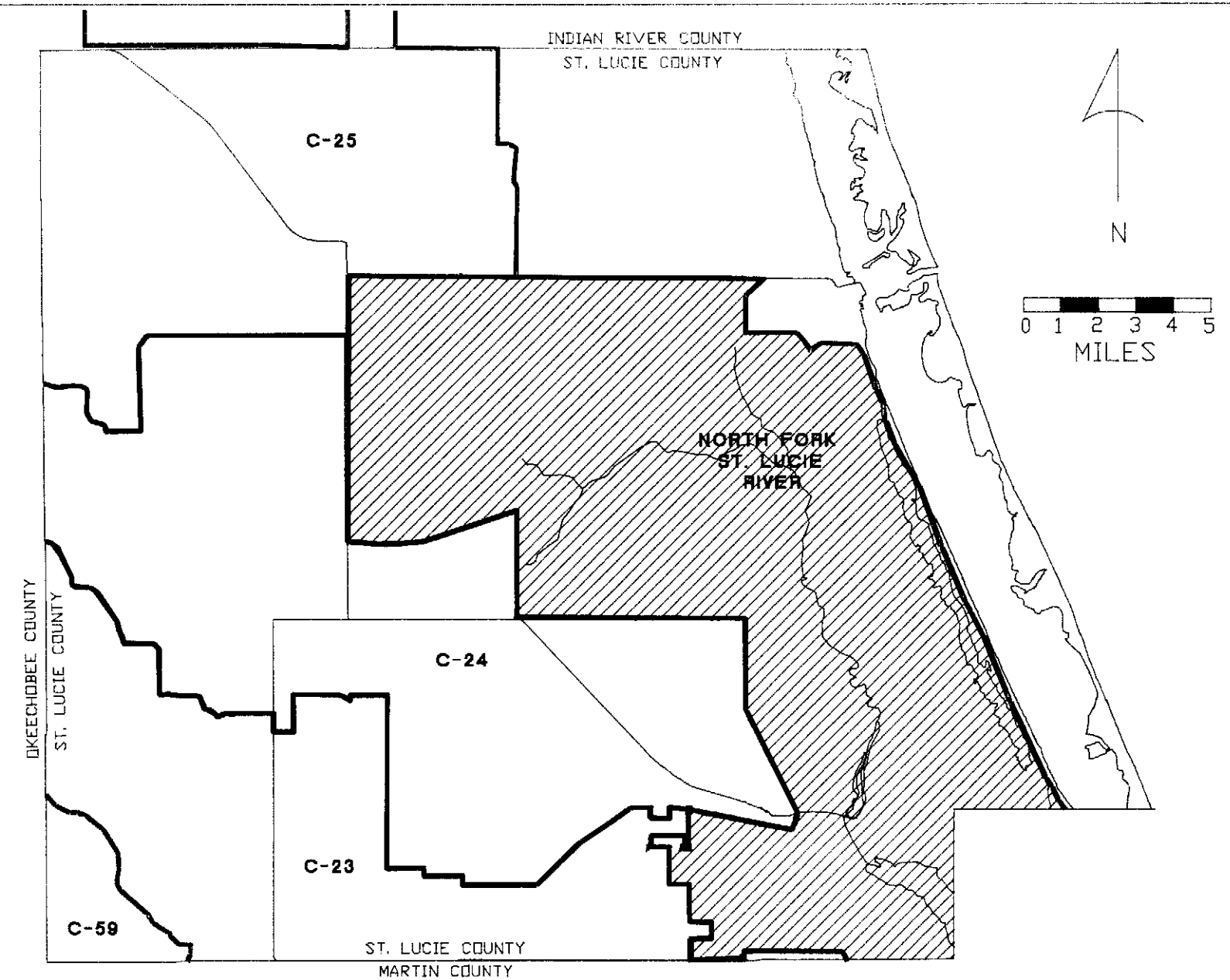

FIGURE 8. NORTH FORK ST. LUCIE BASIN LOCATION MAP

NORTH FORK ST. LUCIE BASIN

NORTH FORK OF THE ST. LUCIE RIVER BASIN

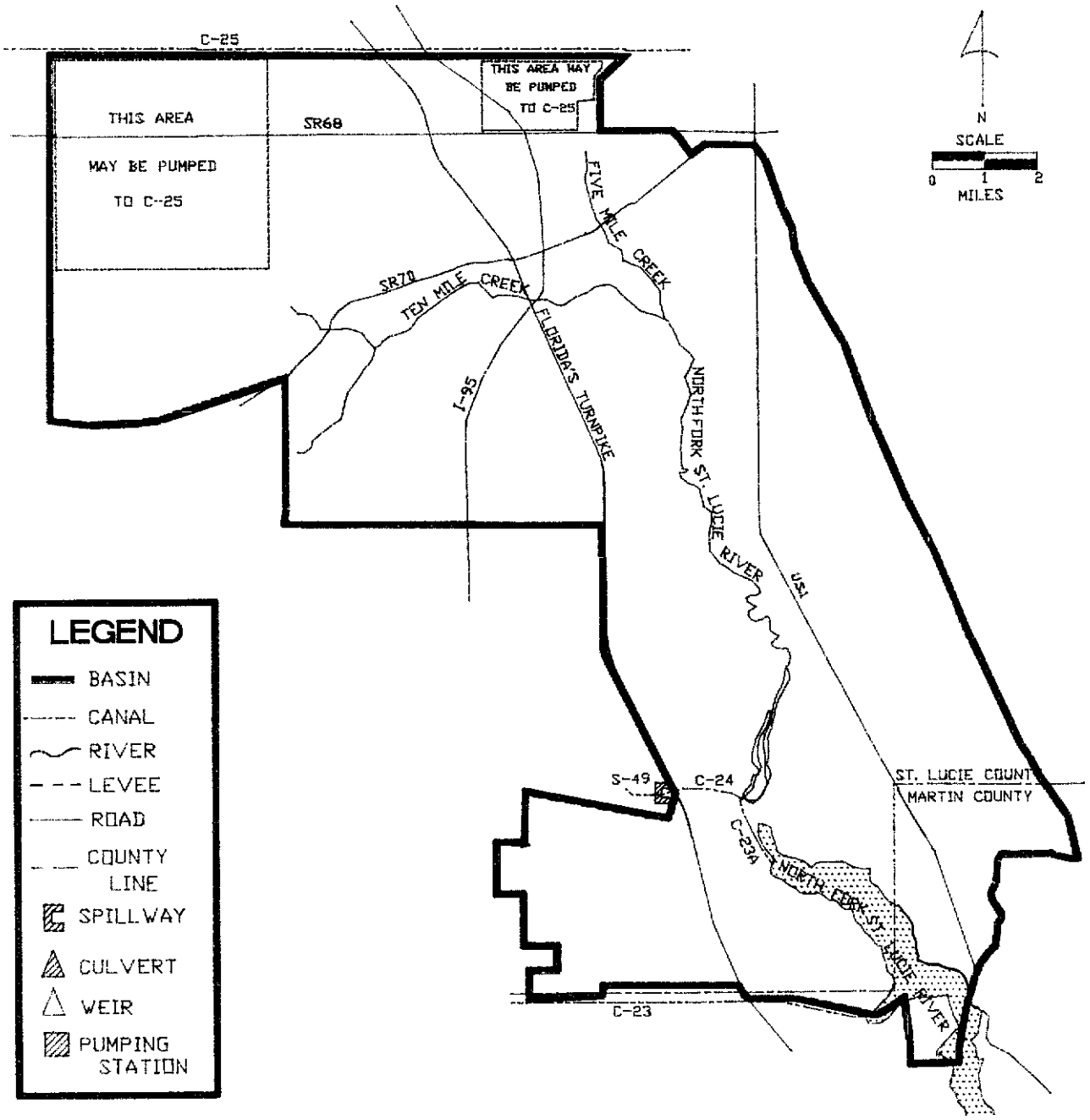

FIGURE 9. THE NORTH FORK OF THE ST. LUCIE RIVER BASIN

C-59 (TAYLOR CREEK-NUBBIN SLOUGH) BASIN

Description of the Basin

The C-59 drainage basin is approximately 187.9 square miles in area and is located in eastern Okeechobee County (159.8 square miles), southwestern St. Lucie County (9.4 square miles, Figure 10) and northwestern Martin County (18.7 square miles). The basin boundary in St. Lucie County relative to local roads and landmarks is shown in Map A. A schematic map showing the basin boundary, canals and control structures is given in Figure 11.

The Project canals and control structures in the C-59 basin have two functions: (1) to remove excess water from the C-59 basin, (2) and to supply water to the S-133 basin during periods of low natural flow. Excess water is discharged from the basin to Lake Okeechobee by way of C-59 and S-191. Water surface elevations in the canals in the basin are regulated by S-191. Water supply to the S-133 basin is made by way of G-106. Water supply to the C-59 basin is from local rainfall.

There are three Project canals in the C-59 basin: C-59, the L-63S/L-64 borrow canal, and the L-63N borrow canal. The L-63N and the L-63S/L-64 borrow canals are tributary to C-59.

C-59 begins at the confluence of the L-63N and the L-63S borrow canals about five miles southeast of the City of Okeechobee. C-59 extends to the southwest approximately 1.2 miles and is connected to Lake Okeechobee via S-191. Flow in the canal is to the southwest to Lake Okeechobee.

The L-63S and the L-64 borrow canals drain the southeast portion of the basin. The canals are continuous along the southwest boundary of the basin. The L-63S borrow canal is aligned parallel to and south of State Road 710 from the Florida East Coast Railway crossing of State Road 710 to the confluence of the borrow canal with C-59. The L-64 borrow canal is parallel to and east of the Florida East Coast Railway from the railway's crossing of State Road 710 to a point about eight miles north of C-44. A plug in the canal at that point separates the L-64 borrow canal from the L-65 borrow canal that continues to the south. This plug acts as a divide between the S-153 basin and the C-59 basin. Flow south of the plug in the L-65 borrow canal is to C-44. Flow north of the plug in the L-64 and L-63S borrow canals is to the northwest to C-59. Four streams are tributary to the L-64 and L-63S borrow canals. Myrtle Slough drains the portion of the basin in Martin County. Henry Creek and Lettuce Creek drain the area near where Okeechobee, Martin, and St. Lucie Counties meet. Nubbin Slough drains the eastern part of the basin in Okeechobee County.

The L-63N borrow canal drains the northwest portion of the basin. The canal intercepts Taylor Creek at S-192, 1.3 miles north of the City of Okeechobee. Upper Taylor Creek (i.e., north of the L-63N borrow canal) drains to C-59 by way of the L-63N borrow canal. Lower Taylor Creek (i.e., south of the L-63N borrow canal) drains to S-193 directly or to S-133 by way of the L-D4 borrow canal. Mosquito Creek, draining the central part of the basin, is tributary to the L-63N borrow canal. In addition to its primary function as a drainage canal, the L-63N borrow canal is also used to supply water to the S-133 basin by way of structure G-106.

There are three Project control structures regulating flow in the C-59 basin: S-191, S-192, and G-106. Design criteria for the structures in this basin are given in Table 4.

S-191 is a gated spillway located in the alignment of C-59 at the outlet of the canal to Lake Okeechobee. The structure has two functions: (1) to maintain optimum stages upstream in C-59, and in the L-63N and L-63S borrow canals, and (2) to prevent a hurricane tide on Lake Okeechobee from entering the C-59 basin. The gates are operated in so far as is possible to maintain a headwater stage in the C-59 canal of 19.0 ft NGVD. The gates are closed if the tailwater stage (lake side) reaches or exceeds the headwater stage.

S-192 is a gated culvert and pump station located in L-63N at the point the levee crosses Taylor Creek (see insert, Figure 5). The gates on the culvert are ordinarily closed so that the structure functions as a divide between the C-59 basin and the S-133 basin. The gates may be opened for two reasons: (1) to divert flows from upper Taylor Creek and the L-63N borrow canal to lower Taylor Creek to facilitate maintenance on the borrow canal; or (2) to augment flows in lower Taylor Creek to mitigate (by dilution) the effects of the poor quality water that occurs periodically in the lower portion of the creek. The diversions to mitigate the poor quality water are only made when Lake Okeechobee is below 14.0 ft NGVD (i.e., when gravity discharge to the lake can occur through S-193). When the lake stage is higher than 14.0 ft NGVD, S-193 is opened to discharge enough water to the S-133 basin for dilution of the poor quality water in the creek. The same quantity of water that is discharged to lower Taylor Creek by S-193 is removed from the S-133 basin by the pump station at S-192 and is discharged to the L-63N borrow canal.

G-106 is a gated culvert located in L-63N at the point where the levee crosses Mosquito Creek. This is about two and one-half miles east of the City of Okeechobee. G-106 discharges to Mosquito Creek south of the levee. The gates are occasionally open for water supply to the S-133 basin, but are closed most of the time.

Comments on Design and Historic Operation

S-191, C-59, and the L-63N and the L-63S borrow canals were designed to pass 30 percent of the Standard Project Flood from the C-59 basin without flooding occurring in the basin.

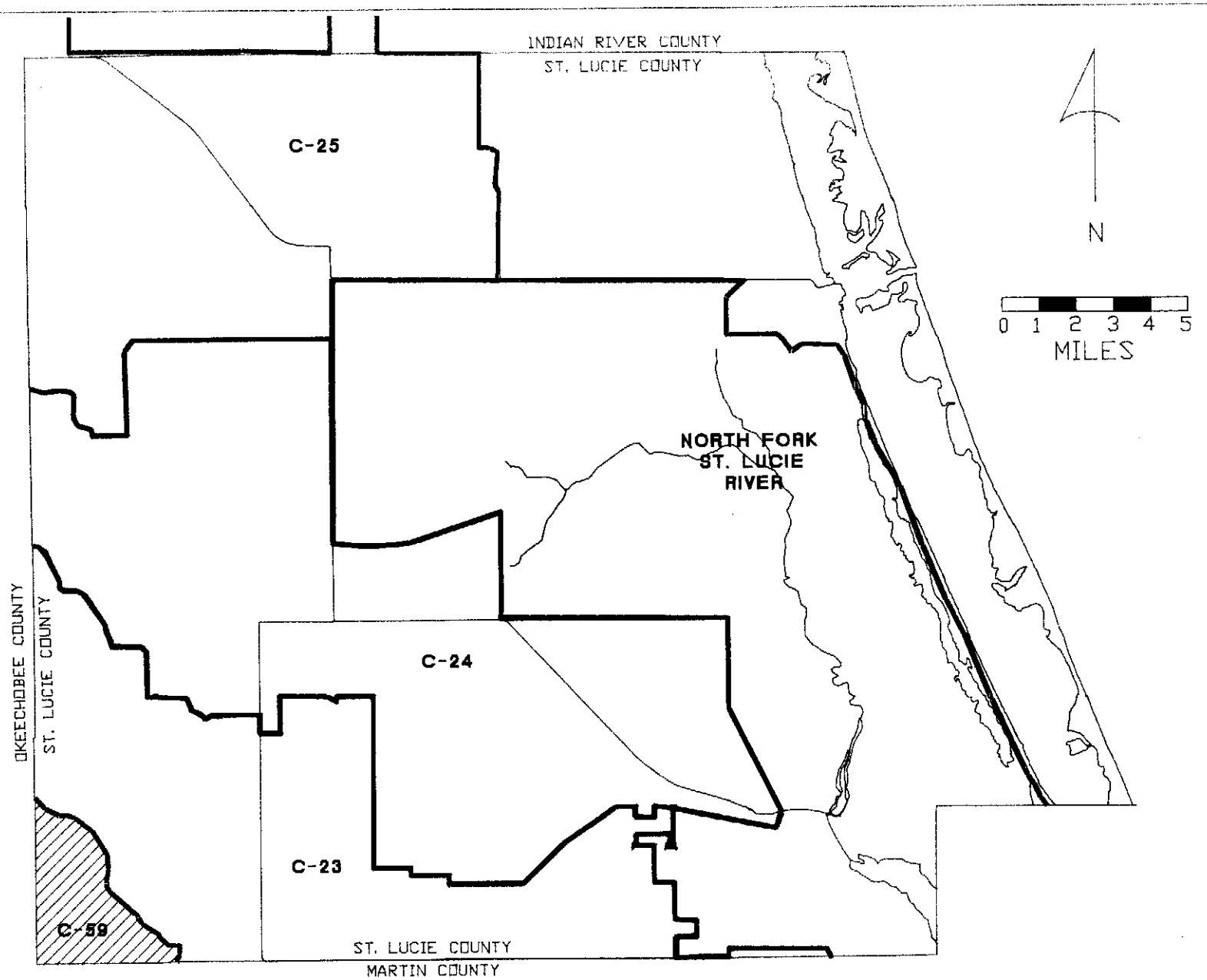

FIGURE 10. C-59 (NUBBIN SLOUGH)
BASIN LOCATION MAP

C-59 BASIN

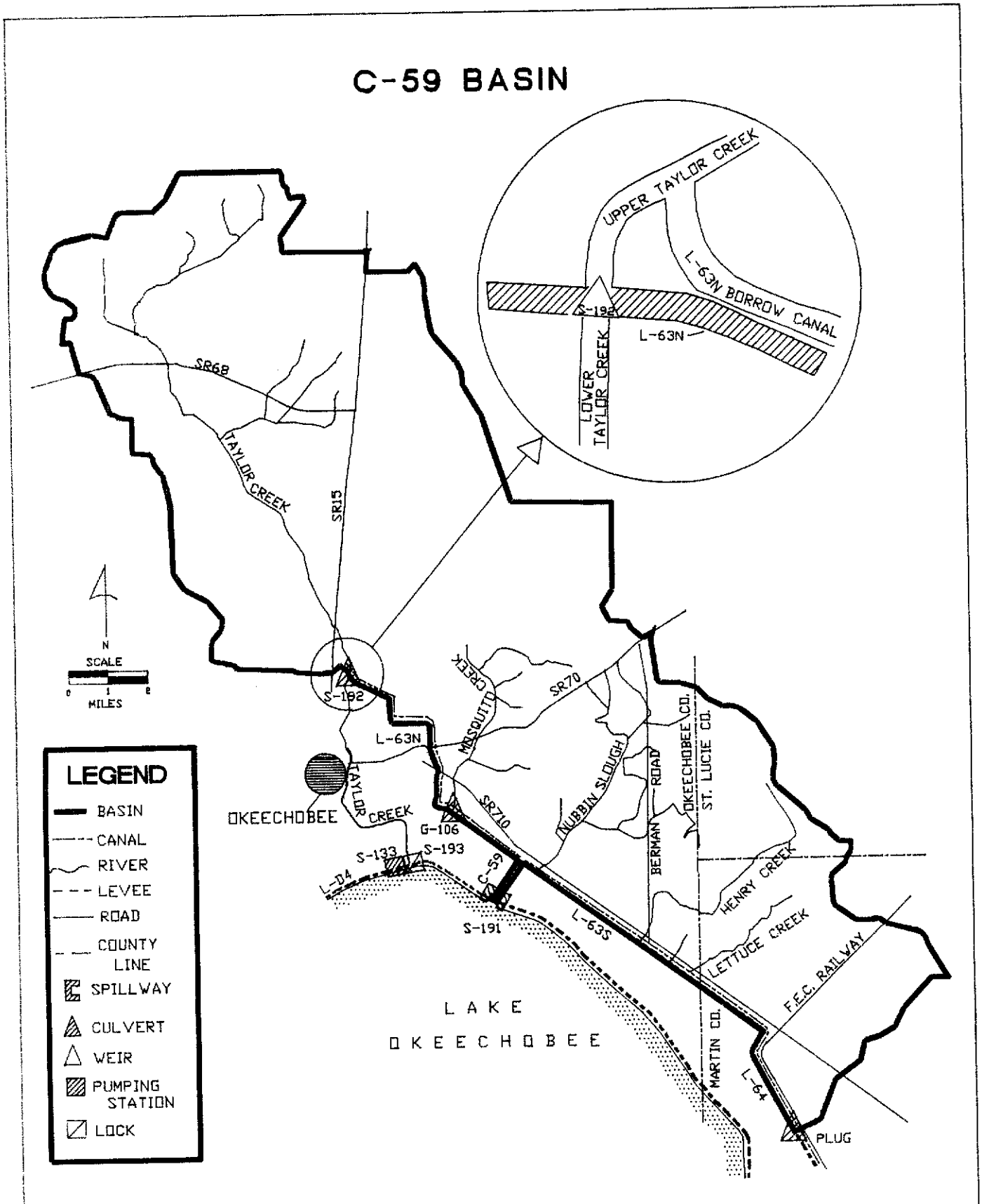

FIGURE 11. THE C-59 BASIN

TABLE 4. C-59 Basin Structures - Design Criteria

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)	Peak Stage (ft NGVD) Peak Discharge (cfs)	Date of Peak
S-191 Stage divide	Gated Spillway, 3-gates 17.6ft high x 27.8 ft wide Net crest lgth = 81.0ft Crest elev = 7.4.ft NGVD	19.2	18.6	19.0 19.2 ≥ HW ≥ 18.8 (Gate closed if TW > HW)	7440	HW = 23.08 Q = 3236	7/18/74 6/25/82
S-192 Divide structure and pump station, Water supply from L-63N borrow canal to Taylor Creek	Gated Culvert 1-48in x 112ft CMP Invert elev = 8.0ft NGVD Pump Station, 1 unit: 13500 GPM	21.6 (water supply)	13.0 (water supply)	HW = 19.0 TW = 14.0 (water supply)	Normally closed, open only for water supply		
G-106 Divide structure and water supply from L-63N borrow canal to S-133 basin	Gated Culvert 1-36in x 90ft CMP invert elev. = 15.0ft NGVD				Occasionally open for water supply		

in = inches
ft = feet
elev = elevation

lgth = Length
TW = Tail water
Q = discharge in cfs

CMP = Corrugated metal pipe
RCP = Reinforced concrete pipe
ft NGVD = Feet relative to National Geodetic Vertical Datum

HW = Head water
CFS = Cubic feet per second

ds = downstream
ups = upstream

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APPENDIX 1 - BASIC CONCEPTS

Runoff and Drainage - Several things can happen to rain after it falls to earth. At the beginning of a rain event, the rain will most likely seep into, or "infiltrate", the soil. As soil becomes saturated, however, the rain will tend to pool on the surface of the ground in puddles or ponds. These detention areas have only a limited storage volume, and when their capacity is exceeded, the excess water will flow downhill to the nearest stream or canal. That part of the rainfall that "runs off" of the soil surface to enter local streams is termed "surface runoff". Of the water that is detained on the surface, some will evaporate and the balance will eventually seep into the ground.

Water seeping into the ground enters a reservoir of subsurface water known as groundwater. Since, in South Florida, many soils are very sandy and underlying rock strata tend to be very porous, water flows easily between surface water and groundwater. The surface of the groundwater is known as the "water table". When the water table level is higher than local surface water levels, water will enter the surface water from groundwater. When the water table is lower than the local surface water level, flow is from surface water to groundwater. In general, groundwater supplements stream flow during periods of low rainfall, and surface water recharges groundwater storage during periods of high rainfall. Although subsurface flow from groundwater to surface water is important to the long term supply of water to a canal or stream (it is sometimes referred to as "base flow"), it does not make significant contributions, if at all, to streamflow during storm events with high rainfall.

In the context of these basin descriptions, the term drainage is used to refer to the total surface and subsurface flows entering a canal from its drainage basin. It may be useful to keep in mind, however, that during a rain event (especially one severe enough to cause flooding), it is surface runoff that is the important contributor to this flow, and at times between rain events, subsurface flow from groundwater to surface water is most important.

Runoff from an area is influenced by several factors: how much rain has fallen recently, the depth to the water table, and how the land in the area is used. The amount of recent rain, and the depth to the water table dictate how much water is in the soil. The degree to which the soil is saturated, in turn, determines how much of the falling rain may infiltrate the soil, and thus, how much of the rain will run off to local streams.

Land use has a large impact on the amount of surface runoff entering local streams and canals. For example, much of the surface area in an urban area (e.g., roofs, roads, and parking lots) is impervious to water. Almost all the rain impacting impervious areas becomes surface runoff. Some water may be detained and will evaporate, but the percentage of rainfall that enters local canals or streams by surface flow in an urban area can be quite high. As a result, urban areas are often subject to high stream flows (flooding) during rain events.

A vegetated area can intercept and retain a large part of the rainfall, and subsequent surface runoff from a rain event. This intercepted water has an additional opportunity to evaporate or seep into the ground. In general, a smaller percentage of the rain falling on a vegetated area will enter local streams and

canals as surface runoff than a comparable urban area. As a result, stream flows in vegetated areas are moderated compared to urban areas.

Drainage Basin - If rain falls over a large enough area, some of the runoff from that storm will likely enter one stream, and some of it will enter another stream. It is said that those streams "drain" different basins, that they are in different "drainage basins". The drainage basin of a stream is all the land that contributes runoff to the stream or its tributaries. It is usually specified as that land which drains to the stream upstream of a given point, such as the mouth of the stream. The boundary between drainage basins is termed a "divide". Runoff is divided along the boundary, with runoff on one side of the boundary flowing to one stream and runoff on the other side of the boundary flowing to another stream.

Water Surface Elevation - A water surface elevation in a canal is the distance from the water's surface to some reference elevation or "datum". In the District, all elevations are relative to the National Geodetic Vertical Datum (NGVD). Water surface elevations are measured in feet (ft). Water surface elevations may also be referred to as "stages".

Important water surface elevations are the headwater (upstream) stage, and the tailwater (downstream) stage at the control structures (see **Control Structure**). The difference between these stages will affect the flow through or over the structure. Gravity flow is always from the highest to lowest elevation and, in general, flow increases as the difference in elevation increases. Note that in some basins, pumps are used to move water from lower to higher elevations.

Water surface elevations elsewhere in the canal reach are also important. Obviously, if the stage exceeds the elevation of the top of the canal, flooding will result. Not as obvious is the fact that the stage in the canal largely determines the water table elevation of the local groundwater (see **Runoff and Drainage**). The stage in the lower reaches (near the ocean) of some canals is maintained at levels high enough to prevent intrusions of saltwater into the local groundwater. In other areas, stages are maintained that keep water table elevations low enough to prevent drainage problems in low lying areas.

Control Structures - The structures referred to in the basin descriptions are devices (e.g., weirs, spillways, and culverts) placed in the canals to control water surface elevations (stage divide), amount of flow (stage divide or water supply structure), or direction of flow (divide structure) in the canals. A structure may have more than one function. In general, a stage divide controls water surface elevation upstream of the structure, and it controls water flow (or discharge) downstream of the structure. A divide structure is usually located at or near a basin boundary. It prevents water in one basin from entering the other basin. A water supply structure is also usually located near a basin boundary. It is used to pass water from one canal to another (i.e., from one basin to another).

Hydraulic Analysis - A set of water surface elevations taken along the length of a canal is known as the hydraulic profile of the canal. In general, water surface elevations always increase in the upstream direction. The water surface elevations are a function of the size and shape of the canal, the amount and location of inflow to the canal, the roughness and slope of the canal, and the downstream water surface elevation of the canal (often determined by some control structure). Canals are designed to pass a certain amount of flow without over-topping their banks. Designing a canal and its structures consists of selecting values for the factors listed

above for which none of the water surface elevations of the resulting hydraulic profile exceed the elevation of the banks of the canal for the design discharge. Since the design discharge is given, and to a large extent the slope of the canal is determined by the topography of the basin, it is the size and shape of the canal, and the downstream water surface elevation (to be maintained by some structure), that are varied to achieve a successful design. (The downstream structure must also be large enough to pass the design discharge.) Because the factors that determine the water surface elevations are either known or can be reasonably estimated, it is possible to calculate the hydraulic profile of a proposed canal design. In this way an appropriate design can be selected. Similarly, calculation of the hydraulic profile, can be used to determine the flood protection provided by a canal constructed without regard to a specific design storm, or for a canal that has been modified with regard to its design specifications. For example, increasing the cross-sectional area of a canal will, in general, allow the canal to pass a given flow at stages lower than before enlargement (i.e., the hydraulic profile is lowered). Hydraulic analysis may determine for this canal that the flood protection has increased, that is, the canal can now pass the runoff from a storm more severe than the design storm.

Design Storm - The design storm for a basin is the most severe storm for which the canals and structures in the basin will accommodate that storm's runoff without flooding occurring in the basin. Sometimes a basin is described as having "flood protection" up to a certain design storm.

A severe storm is described by the frequency with which it may occur. On a long term average, a storm of given intensity may occur, for example, once in every ten years (i.e., the storm has a ten percent chance of occurring in any given year). This is written as 1-10 year, and is read as one in ten years. It must be emphasized, however, that a storm of a given intensity can occur at any time regardless of the frequency assigned to it. For example, two severe storms, of an intensity that occurs on average only once in every one hundred years (1-100 year storm), occurred in northern Palm Beach County within three months of each other in the early 1980s.

The Army Corps of Engineers specifies a Standard Project Storm (SPS) for south Florida. The rainfall amounts for the SPS are those for a 1-100 year storm increased by 25 percent. The storm is assumed to occur during the hurricane, or wet season, when water tables are high and soils are wet. These conditions will maximize the runoff from the storm. The runoff from the SPS is designated the Standard Project Flood (SPF). The capacity of a canal and its structures may be given as a percentage of the SPF (e.g., 40 percent SPF). The storm that would generate this amount of runoff is given by its recurrence interval (e.g., 1-10 years). Note that it is implicitly assumed that these storms occur for antecedent weather conditions that will maximize the runoff from the storm in the basin of interest.

A severe storm of a certain frequency may not generate the same amount of runoff in different basins of the same size even when antecedent weather conditions or water table elevations for the basins are similar. Land use in the basins will affect the relative amounts of surface runoff to be expected from the basins (see **Runoff and Drainage**). Urban areas will often have more surface runoff than will more vegetated areas.

The amount of runoff to be expected per unit area for design storms at various recurrence intervals, antecedent conditions, and land use can be found in the Army Corps of Engineers' General Design Memorandum (GDM) for the Project. The runoff calculated to occur for a given set of storm frequency, antecedent conditions, and land use is the design discharge.

APPENDIX 2 - GLOSSARY

Designations Given to District Works

C-XXX The letter C followed by a number designates a Central and Southern Florida Flood Control Project canal. For example, C-111 reads as "Canal 111".

G-XXX The letter G followed by a number designates a Central and Southern Florida Flood Control Project structure (see **Control Structures**, under **Basic Concepts**). For example, G-72 reads as "Control Structure 72". G structures were built by the District.

L-XXX The letter L followed by a number, designates a Central and Southern Florida Flood Control Project levee. For example, L -38E reads as "Levee 38 east".

S-XXX The letter S followed by a number designates a Central and Southern Florida Flood Control Project control structure (see **Control Structures**, under **Basic Concepts**). For example, S-26 reads as "Control Structure 26". S structures were built by the U.S. Army Corps of Engineers.

Terms

District

This refers to the South Florida Water Management District (formerly the Central and South Florida Flood Control District), the agency which operates and maintains the Project.

Free Digging Contract

This refers to an agreement between the District and an outside party whereby that party excavates a canal (or a portion of a canal). The outside party receives the excavated material as payment for the excavation. The material is generally used as fill for residential and commercial development.

General Design Memorandum

This is a document prepared by the U.S. Army Corps of Engineers that reports all work done preliminary to preparation of the final design of a project. In the General Design Memorandum for the Central and Southern Florida Flood Control Project:

- the basins are delineated.
- a design storm is specified and the resulting runoff is estimated for each basin.
- the flood protection to be afforded each basin is identified.
- the size of canals, and the size and number of control structures is determined.

The final design of the canals and structures is given in the "Detailed Design Memorandum."

1-XXX Year

This designates the recurrence interval for a design storm (see **Design Storm**, under **Basic Concepts**). For example, "1-100 year storm" reads as one in one-hundred year storm.

Project This refers to the Central and South Florida Flood Control Project. The Project has been responsible for the construction of most of the major canals and structures in south Florida.

Regulation Schedule

A regulation schedule specifies the level of water to be held in a reservoir (e.g., Lake Okeechobee) as a function of the time of year.

Regulatory Release

A regulatory release is water discharged from a reservoir (e.g., Lake Okeechobee) to lower the water level in the reservoir to the regulation schedule.

ABBREVIATIONS

cfs : cubic feet per second

ft : feet

GDM : General Design Memorandum

NGVD : National Geodetic Vertical Datum (see **Water Surface Elevation**, under **Basic Concepts**)

SPF : Standard Project Flood (see **Design Storm**, under **Basic Concepts**)

SPS : Standard Project Storm (see **Design Storm**,under **Basic Concepts**)

WCA : Water Conservation Area