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FLORIDA POWER & LIGHT DIKE FAILURE AND ITS IMPACT ON PROJECT FACILITIES

MARTIN AND OKEECHOBEE COUNTIES

OCT. 30— NOV. 6 1979

PHOTO: ALAN ZLOTKY - PALM BEACH POST

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PREPARED BY

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
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PRESENTED TO

SOUTH FLORIDA WATER MANAGEMENT DISTRICT
GOVERNING BOARD
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INTRODUCTION

Some time late in the evening of Tuesday October 30, 1979, a section of the cooling water reservoir dike at Florida Power and Light Company's Martin County Plant began to fail. This failure eventually resulted in the uncontrolled discharge of billions of gallons of water towards the Lake Okeechobee areas of Martin and Okeechobee Counties.

This report has been prepared to set forth pertinent background information about those Project facilities lying within the effected area, to describe the impacts on these Project facilities brought about by this catastrophic event, and to point out the measures taken by the District following the dike failure to hasten a return to normal stages in the flooded areas, within the flexibility allowed by our primary drainage structures.

At the time of this writing, much work is still ahead. Although the water level in the flooded areas is receding, it is still well above normal and will probably not reach a near-normal state for about another week to ten days. Damaged project facilities will most likely require months of restoration activity in order to return them to acceptable design standards. Subaqueous inspections at our primary and secondary structures may turn up further damages not yet identified. Due to these factors and others, this report can only be considered an interim statement of Project conditions and expectations. It is provided as an early information document to the Governing Board for analysis and guidance.

GENERAL DESCRIPTION OF PROJECT FACILITIES

The area most detrimentally effected by the dike failure lies below the 22.0'* contour line and is bordered on the east by Levee 63 south, Levee 64 and Levee 65; on the west by Levee 47 (Herbert Hoover Dike); on the north by the Nubbin Slough South Tieback Levee along Canal 59; and on the south by the St. Lucie Canal North Tieback Levee (see Plate #1). For drainage purposes, this area is considered a pumped area and is served by Pumping Station S-135 located in Levee 47 at Chancy Bay.

The pumping station houses four Johnson 48" vertical, axial flow pumps each driven by 225 HP Caterpillar, D-342, 6 cylinder, in-line diesels. It is designed to remove 3/4" of runoff per day from its service area, which contains in excess of 15,000 acres and is bordered by the Project Levees noted above. The pumping station's total capacity under design conditions is 500 cfs. Design discharge is based on a headwater of 13.0' and a tailwater of 23.0' (Lake Okeechobee). In addition to the pumps, a double 96" diameter gated CMP culvert exists and can be utilized for gravity drainage when Lake Okeechobee is below elevation 13.0', (assuming normal landside conditions) and for water supply withdrawals from the Lake, when necessary. The optimum stage in the L-47 Borrow Canal (Rim Canal) is 14.0'.

A 15' wide X 50' long navigation lock exists immediately south of the pumping station. Also, a duplicate boat lock exists approximately six miles to the north at the Levee 47/Henry Creek juncture. Both navigation lock structures were built under a U.S. Army Corps of Engineer's contract utilizing District funds and are mentioned at this point because of the important function they played during the flood removal operation.

Levee's 63 South, 64 and 65 serve as interceptors and, by means of their adjacent canals, divert upland runoff by gravity drainage away from the pumped area towards the St. Lucie Canal (C-44) or Canal 59 (Nubbin Slough). For all practical purposes, of the three interceptor levees mentioned, Levee 65 was the only one detrimentally effected by the dike

* All elevations in this report refer to the National Geodetic Vertical Datum.

failure. This levee is approximately 9.2 miles in length and has a design grade of 26.5', a crown width of 10 feet and side slopes of 1 vertical on 3 horizontal. In several reaches the interceptor levee embankment is considerably above elevation 26.5' due to excess spoil material being placed in the embankment from required interceptor canal excavation. For instance, opposite the dike failure location, the L-65 crown elevation was approximately 28.5'.

Levee 65 runs parallel to and just west of the Florida East Coast Railway. The western dike of FP&L's Martin County Power Plant cooling water reservoir lies somewhat further to the east beginning one mile north of the St. Lucie Canal and continuing from that point north over the next five miles. A series of secondary inlets (Project Culverts 3 through 11) direct upland runoff at defined low points into the interceptor canal of L-65. Each inlet is anchored and equipped with a flashboard riser. In order to provide added protection to the railroad during low water conditions each riser has a metal strut affixed to prevent flashboard removal. The fixed flashboard crest at each inlet varies between elevation 17.5' and 19.0'. A continuous inflow control mound (Crown elevation varies from 24.0' at the south end to 27.0' at the north end) runs along the east side of the interceptor canal and directs all inflow to the secondary inlets. A divide structure consisting of a double 72" X 92' CMP culvert with flashboard riser exists at the junction of the L-65 and L-64 interceptor canals. The top elevation of the flashboards is at 21.0' on the L-64 side. Interceptor canal flow is directed towards the St. Lucie Canal and discharge into C-44 takes place through water control structure S-153.

Structure 153 is a reinforced concrete, gated, two-bay spillway with an ogee weir (crest elevation 12.2'). The structure is provided with an operating platform to accommodate the gate-operating equipment, a control house, a service bridge (H20-44) that crosses the structure at the protection grade, and 7-foot high breastwalls. The gates for the spillway structure are wheeled cable operated vertical-lift gates of welded construction

consisting of structural carbon-steel members and skinplates. The gate hoists (cable lifts) are hydraulically powered and designed to open and close the gates at a rate of 6 inches per minute. The structure operates under commercial electric power, but has standby generator power for use during power outages. An 18" riprap blanket has been extended 60' downstream and 30' upstream of the structures concrete sill. Riprap design was based on a maximum velocity of 8 fps. A row of baffle blocks has also been incorporated into the concrete sill to dissipate discharge energy. Design discharge (once in ten year storm) is rated at 2100 cfs with a headwater elevation of 19.5' and a tailwater elevation of 18.5' (gate design) or 12.0' (stilling basin design). The Standard Project Flood condition (approximately 1:220 year return frequency) calls for a discharge of 4400 cfs, a headwater elevation of 23.0' and a tailwater of 18.8'.

The St. Lucie Canal (C-44) is one of the two principal outlets to Lake Okeechobee. It has an invert elevation which varies from about sea level at the west (Lake Okeechobee) end to about -15 feet at the east end where it enters the South Fork of the St. Lucie Estuary. The average canal width is about 160 feet. The canal passes flood discharges from Lake Okeechobee and from the 170 square mile drainage area east of the Lake. It is part of the Lake Okeechobee Waterway which provides navigation across the state from Ft. Myers to Stuart. The canal also conveys agricultural and urban water supply requirements from Lake Okeechobee as well as supplying make-up water for the ill-fated FP&L reservoir.

The canal was constructed many years ago by local interests. The banks of the canal are very steep and cut through very loose material, hence they are very erodible. A non-erosive discharge of 2500 cfs at S-80 has been established, and discharges in excess of this amount are made only when severe flooding is threatened.

The Port Mayaca Lock and Spillway, S-308, is a reinforced concrete, gated spillway with discharge controlled by four cable operated, vertical lift gates and a reinforced concrete lock chamber with two pairs of sector gates. The structure is located at the head

of the St. Lucie Canal on the east shore of Lake Okeechobee. It is operated by the U.S. Army Corps of Engineers and controls releases from the Lake and allows navigation between the Lake and the east coast via the St. Lucie Canal.

The spillway is one of the two principal outlets from Lake Okeechobee, and it is used in passing flood releases from the Lake. The standard project design discharge is 14,800 cfs. The spillway is ogee shaped with a crest elevation of 9.1'. Each of the four gates is 29 feet wide X 16.9 feet wide. The spillway service bridge elevation is 40.0'. The spillway is operated normally to make flood control releases in accordance with the Lake Okeechobee operation schedule and to make releases for agricultural and other uses into the St. Lucie Canal to maintain an elevation in that canal of 14.0' to 14.5', when water is available. During severe droughts, such as occurred in 1971, the level may recede to 10.5' or less.

The St. Lucie Lock and Spillway (S-80) is a reinforced concrete, gated spillway with discharge controlled by seven cable operated Tainter gates and a reinforced concrete lock chamber with two pairs of sector gates. The structure is located near the eastern or tidewater end of the St. Lucie Canal. It is operated by the U.S. Army Corps of Engineers and controls releases from Lake Okeechobee and direct inflows to the St. Lucie Canal. The lock allows navigation between tidewater and the St. Lucie Canal.

The spillway is designed to pass the standard project flood of 16,900 cfs. The spillway is of irregular shape with a crest elevation of 0.56'. Each of the seven Tainter gates is 20 feet wide X 10.5 high. The service bridge elevation is 20.6'. The spillway is operated normally to make flood control releases in accordance with the Lake Okeechobee operation schedule and to maintain an optimum stage in the St. Lucie Canal between elevations 14.0' and 14.5', when water is available.

ADDITIONAL BACKGROUND INFORMATION

This District first became involved with the FP&L Martin County Power Plant (Seminole Project) in October of 1972.

A public hearing was held October 26, 1972, regarding allocation of water for use by this project. At the Governing Board meeting of December 15, 1972, the Board voted unanimously to allocate the necessary water and issue a permit for withdrawals subject to an agreement between the District and FP&L. This agreement was executed on June 8, 1973 and a copy is included in the appendix of this report.

Concurrent with our District's involvement concerning water use, FP&L proceeded to acquire the necessary construction permits from other regulatory agencies.

Construction of the reservoir began in April, 1974 and was completed in July, 1977.

FP&L began filling the 6600 acre cooling water reservoir on February 6, 1978, with a 24 hour pumping operation. The minimum operating level of 31 feet was reached on March 7, 1978. The maximum level of 37 feet was reached on April 3, 1978. This level was maintained through August, 1979. No replacement water was requested for September, 1979, as the reservoir level exceeded 37 feet following the rains experienced in Hurricane David. At the end of September the reservoir stage was 37.24'; on the day of the failure it was 36.74' and the storage in the reservoir was 80,700 acre-feet.

FP&L submitted the results of their structural inspection pursuant to conditions of the District permit on June 15, 1979. This report indicated that everything was sound with respect to the reservoir dike's structural integrity.

Prior to the failure of the FP&L dike, an act of vandalism was carried out at the District's water control structure (S-153) located at the outfall end of the L-65 interceptor canal. Inasmuch as the water level in the interceptor canal upstream of S-153 was at elevation 16.1' at the time of the dike failure, a more detailed explanation of

the vandalism event and our operations at the structure is in order.

Structure S-153 normally operates in the automatic mode such that when the canal headwater stage rises to elevation 19.2 feet, the two gates begin to open. Where the stage falls or rises to elevation 18.85' the gates stop moving, and when the stage falls to 18.37' the gates begin to close. At about noon on Saturday, October 27 the stage reached elevation 19.2', the gates began to open, the stage dropped to 18.85', when the gates had opened 0.7 feet. The stage continued to fall, but before it had fallen to 18.37', at about 1415, someone turned off the power at the electrical control panel on the outside of the structure. The #1 and #2 gates were found open 0.75 feet and 1.0', respectively, by the water reader who routinely visited the structure about 0930, Monday, October 29. At that time the gates were closed, and the structure was left on the automatic mode. While the gates were open, the L-65 canal stage dropped to the elevation of the St. Lucie Canal, about 14.1'. After the gate closure, the L-65 stage recovered to elevation 16.1' as previously noted above. See Plate #3 for a graphic representation of headwater and tailwater elevations along with gate openings at S-153 during the period October 27 to November 2.

Although the canal stage was low during this 3 day period, no excess stress should have been placed on the FP&L reservoir dike since stages east of the interceptor canal are controlled at or above elevation 17.5' by means of the inflow control mound and secondary inlet controls previously described. While these facilities were established for erosion protection and to guard against scour problems through openings in the railroad grade, when a low water condition existed in the interceptor canal, they most certainly could serve the dual purpose of preventing unusual drawdowns in the reach contiguous to the reservoir dike.

Refer to the appendix for the vandalism reports received from the field. The Martin County Sheriff's Office has been notified.

THE SCENE REVISITED - ACTION TAKEN

A call was received from the FEC Railway Office by the District's duty officer at about 0120 on October 31. The message was that one of their freight trains had been derailed about three miles north of the St. Lucie Canal and that the train crew reported a flash flood. This report was passed on to the Department of Field Services.

The Okeechobee Field Station Superintendent was alerted and directed to proceed to the S-153 area. In addition, the radio base station at Pumping Station S-5A was activated. Shortly after this action was taken a call was received from the Martin County Sheriff's Office regarding the same message of a flash flood. Since a reservoir dike failure was already suspect, they were advised to call FP&L. The Corps of Engineers were alerted by calling the Area Engineer's Operation Chief in Clewiston. Another call was received from the Sheriff's Office confirming that the FP&L reservoir dike had indeed failed. The Sheriff had wisely begun evacuation of the populated areas lying in the wake of the flood. A call to FP&L's Reservoir Operation's Chief at the Martin County Plant's pumping station revealed that maximum discharges were being made through their spillway into the St. Lucie Canal.

At this point (0300), the Director of Field Services and Executive Director were advised of the disaster and the helicopter was ordered ready for departure at 0500. Meanwhile, all possible action was taken at S-153 by the field station superintendent. In addition, the S-135 pump station crew had been ordered to their station and had fired up all four pumps by 0330.

The navigation lock at S-135 was ordered opened when the elevation in the Rim Canal exceeded the Lake stage. The same action was taken at the Henry Creek Lock only at a later time due to the lag in the flood wave's northerly sweep.

Stages in the Rim Canal rose so quickly that the pump station crew members were not able to remove much of the tools, equipment and other material stored in the lower section

of the pump house (deck elevation 16.0'). This area was entirely inundated in short order. One of the items stored in this area was the wheel utilized for cranking open the double 96" diameter gated CMP culvert at the pump station. Another wheel was located and taken to the S-5A machine shop where it was modified to fit the turning stem at S-135. The gates were opened as soon as the modified wheel was delivered to S-135.

As the flood wave moved over the pumped area of S-135, during the early morning hours of October 31, little else could be done other than to alert crews and to mold and remold possible recovery plans and the mobilization of earthmoving equipment.

Plans were readied to bring in one of the District's crawler draglines (Bucyrus 30-B) and a couple of dozers. Coordination activities were initiated with the railroad, FP&L and Corps of Engineers. When stages in the St. Lucie Canal exceeded Lake stage, the navigation lock at S-308 was cracked open by the Corps and some discharge was directed towards the Lake. Gate openings at S-153 had to be cut back from about 8' to approximately 5.5' in order to protect the structure's stability.

In order to improve the removal of flood waters consideration was given to:

(1) breaching L-65 approximately 1/4 mile upstream of S-153;

(2) breaching the St. Lucie Canal North Tieback Levee west of L-65; and

(3) breaching the L-47 Tieback in order to allow the Rim Canal to discharge directly into the St. Lucie Canal.

These proposals were reviewed with the Corps' Chief Engineer (Jacksonville District) and it was agreed that breaching L-65 would be the most acceptable. This action was taken and internal ditches on private property are currently being improved to facilitate drainage through the breached area.

On October 31, 1979, discharges out of the St. Lucie Canal and into the Estuary reached an estimated peak in excess of 15,000 cfs for a period of several hours. Discharges were

gradually reduced to about 200 cfs on November 2. Due to the relatively high level of the peak discharges, District biologists carried out observations within the Estuary on Friday, November 2.

The high discharges necessitated by the emergency did not appear to have a significant adverse impact on the Estuary, probably due to the short duration of peak flows. Turbidity levels were undoubtedly very high during the maximum discharge period and were still at relatively high levels on Friday. Further evaluation of data will be carried out, in addition to regularly scheduled data collection trips to the Estuary.

On November 4 a mobile dragline was deployed to US #441 in order to improve flow through the highway bridges, where aquatic weeds and debris were clogging the bridge openings causing substantial headloss. This has been accomplished.

One of the first recovery actions by FP&L will be the dewatering of the blown out portion of the reservoir dike area to allow their consultant's (Brown and Root) to perform an engineering investigation aimed at finding causes for the failure. We have assisted in this operation by plugging the L-65 interceptor canal just downstream of the blowout. In addition, pumps at the plug are now being manned around the clock by District forces.

Measures are also being taken to prepare for handling runoff should significant rainfall occur within the two basins (gravity and pumped areas). Approximately 0.5" has fallen in the general area since the dike failure without any noticeable effects on our operations. Nevertheless, precautionary measures must be taken. A 30" angle pump has been loaned to us by FP&L and is in operation at the L-64/L-65 Divide Structure. This pump will serve the reach of L-65 interceptor canal between the shoal and the divide structure.

In the reach of interceptor canal between the drawdown plug and S-153, certain levee breaches are being readied for hasty repair to offset the possibility of upland runoff entering the pumped area. In addition, this reach of canal has been drawndown to at or

near the level of St. Lucie Canal.

As levels subside and approach a near-normal condition, underwater investigations, with District certified SCUBA divers, will begin in order to assess damages incurred below the waterline.

REVIEW OF RESERVOIR DIKE FAILURE AND RESULTANT FLOODING

The dike failure occurred about 2330 on October 30 on the western side of Florida Power and Light's cooling water reservoir (see aerial photo in Appendix). The failure was located about two miles north of the St. Lucie Canal at a point where the Florida Power and Light dike runs almost parallel to the Florida East Coast Railway and Levee 65, as shown on Plate #1.

The near full (elevation 36.74') cooling water reservoir began to empty and rapidly fill the area between L-65 and the reservoir dike, flooding the F.E.C. Railroad grade (elevation 24.0'). A northbound freight train had passed through with no problem at 2200 on October 30, before the failure occurred. Upon returning southbound, the train became caught in what the crew reported as a "flash flood" and derailed at about 0100 on October 31. Unknown to anyone at the time, the "flash flood" reported by the train crew at Barley Barber Swamp was part of the massive flood wave beginning to leave the FP&L reservoir 1 3/4 miles to the south.

The flood wave over-topped the railroad washing it out and spilled over and through the L-65 inflow control mound, into the interceptor canal sending a flood wave to the north and south along the canal and westward over and through the L-65 levee towards Lake Okeechobee. The southbound wave caused the S-153 structure to open automatically and begin discharging into the St. Lucie Canal, but the flood wave surge far exceeded the structure's capacity with the gates only opening at a rate of 6" per minute. Consequently the headwater continued to rise, reaching a peak elevation of 26.13' at 0200 on October 31. (Peak discharge at S-153 amounted to approximately 3700 cfs.)

The high stages produced by the flood wave caused the flood waters to bypass S-153 to the east and over-top the St. Lucie Canal North Tieback Levee. It is estimated that about 15,000 acre-feet of the total 80,700 acre-feet in the reservoir flowed into the St. Lucie Canal through and around S-153 on October 31.

The stage in the St. Lucie Canal rose rapidly once S-153 opened, and this Canal peaked at a stage of 20.27' at about 0400 at Port Mayaca. The Corps of Engineers began opening S-80 at about 0230 and this structure peaked at a stage of 15.8' at about 0430 when the discharge was estimated to be in excess of 15,000 cfs. The Corps also opened both the spillway and the lock at S-308 allowing about 4,000 cfs to enter the Lake between 0400 and 0930 when the St. Lucie stage dropped below the Lake stage.

About 58,000 acre-feet of the cascading water flowed across L-65 and flooded the area shown on Plate 1. About 1000 acre-feet flowed slowly from the reservoir through L-65, S-153 and into the St. Lucie Canal on November 1. The flood wave spread over the sugar cane fields to the west before over-topping U.S. Highway 441 and entering the Rim Canal outside the Herbert Hoover Dike. The surge then traveled northward in the Rim Canal reaching the District's Pump Station S-135 (7 miles north of the St. Lucie Canal) between 0400 and 0500. The pump station crew had already been alerted and were pumping S-135 at full capacity into Lake Okeechobee by 0330. The stage at S-135 continued to rise until a peak stage of 21.15' was reached at 1200. The flood wave continued northward through the more populated areas which were evacuated earlier by the Martin County Sheriff's Department. The Rim Canal reaching a peak the next day (November 1) at the north end of the basin 17 miles from the St. Lucie Canal. The flood was contained at this northerly point by the Nubbin Slough South Tieback Levee along Canal 59. The maximum area flooded, as shown on Plate 2, was about 14,100 acres. By November 6, this area had been reduced to about 9,000 acres.

An accounting of the flood water in the area between the Herbert Hoover Dike and L-65 is shown in Table I at the end of this report. By November 6 the outflow rate had been reduced

to the capacity of the S-135 pump station, since the stage east of the Lake was below the Lake level. Consequently, the time to remove the rest of the flood waters to an elevation of 14.0' is estimated to be about 2 weeks.

IMPACT ON PROJECT FACILITIES

Damages to Levee 65 were extensive. Several blowouts occurred in both the levee and in-flow control mound. Numerous berm drainage culverts were either disturbed or blown out by the flood waters. A large shoal has entirely filled the interceptor canal immediately north of the main blowout area. Many shoals and canal bank erosion exist in several other areas. Most project culverts appear to be intact. However, Project Culvert 9 (60" dia. X 62" CMP) was not visible during aerial inspections and ground surveys in the vicinity of the main blowout area (see Plate #2). Its fate is not known at this time.

Structure 153 appears to be in satisfactory condition above the water line despite the impact of a tremendous flood wave that exceeded SPF stages by over three feet. Subaqueous inspections will most likely turn up a sizable downstream scour hole and some movement of the riprap blanket.

Pumping Station S-135 experienced considerable problems due to the inability that existed in preventing trash and other debris from entering the pump intakes. The top elevation of the needle racks is 16.0'. Consequently, with the flood surge exceeding this elevation, debris flowed over the top of the strainer bars and into the upper part of the pump bays eventually bringing it directly into the suction tubes of the four pumps. This reduced pump efficiency by some unknown amount (educated guess - 50%). At 1200 on October 31 pump unit #4 had to be secured due to excessive vibration caused by a foreign object lodged in the pump which resulted in the failure of a flexible shaft coupling between the engine and pump. This unit will have to remain down until the water recedes to elevation 15.5' and the bay can be dewatered for inspection and for removal of the foreign object in the pump. On Saturday November 3 the pump station was totally shut down for about six hours to facilitate debris removal from the pump bays and from inside the suction

tubes. District SCUBA divers were utilized for this purpose, including debris removal at the needle racks.

The two navigation locks (S-135 and Henry Creek) appear to be in satisfactory condition above the water line. However, discharge velocity through the lock chamber during peak flow may have reached 15 fps. Consequently, movement of the riprap protection is inevitable. This will be the subject of an underwater inspection when water levels return to near-normal.

The S-135 and Henry Creek Lock service road bridges over the Rim Canal experienced damages due to the excessive velocity that were generated by the flood wave. In each case, canal slopes through the bridge section have been extensively eroded and the approach slabs have been weakened or entirely severed. Both bridges have been closed to traffic until repairs can be made.

No damage was incurred to the Lake Levee (L-47), but the St. Lucie Canal North Tieback Levee was breached east of L-65 by flood waters that bypassed S-153 (see Plate #2).

Overall damage to Project works is roughly estimated to be between $300,000 and $500,000. More detailed ground surveys and underwater investigations will help refine this cost estimate. If extensive damage is discovered at S-135 (Pump Unit #4), costs could even exceed the $0.5 million mark.

Table I
East Shore Flooded Area
(Acre-Feet)

Date	Volume in Flooded Area at the End of Day	Outflow			
		Locks	S-135 Pumping	S-135 Culvert	S-153
Oct. 31	50,000	6800	740	---	---
Nov. 1	41,400	7940	830	940	3000
Nov. 2	30,200	7000	750	1500	2000
Nov. 3	22,200	5000	750	750	1500
Nov. 4	18,000	2800	750	650	0
Nov. 5	14,800	1920	750	530	0
Nov. 6	13,550	500	750	0	0

AREA AFFECTED BY F.P.&L. DIKE FAILURE

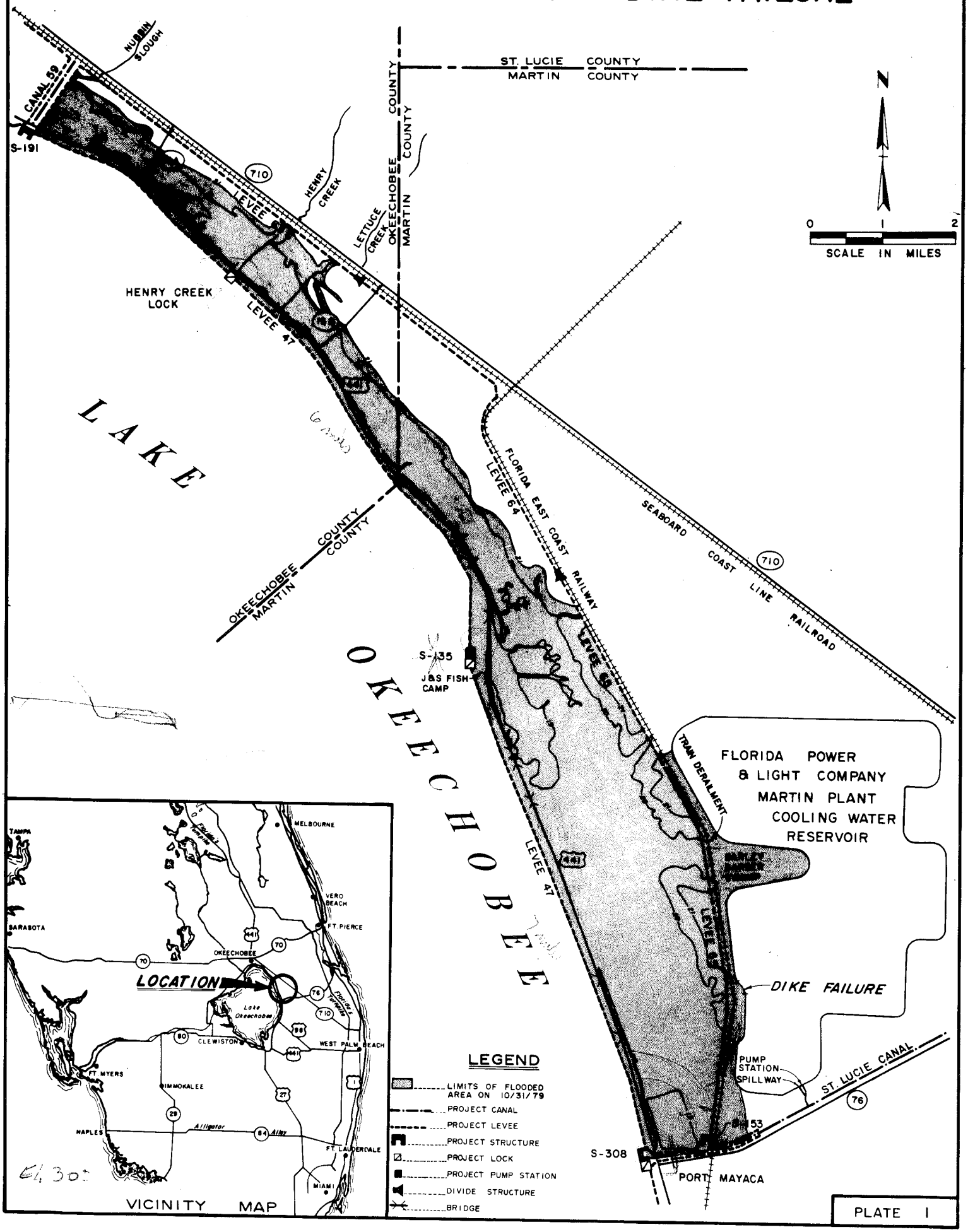
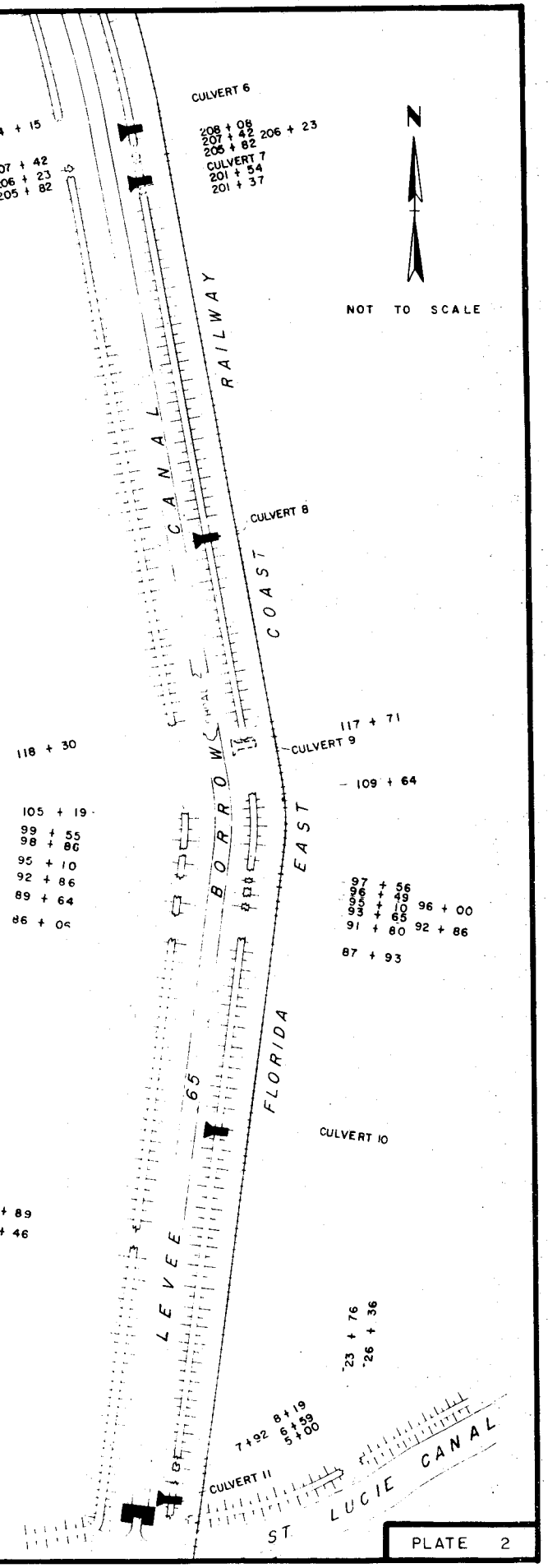
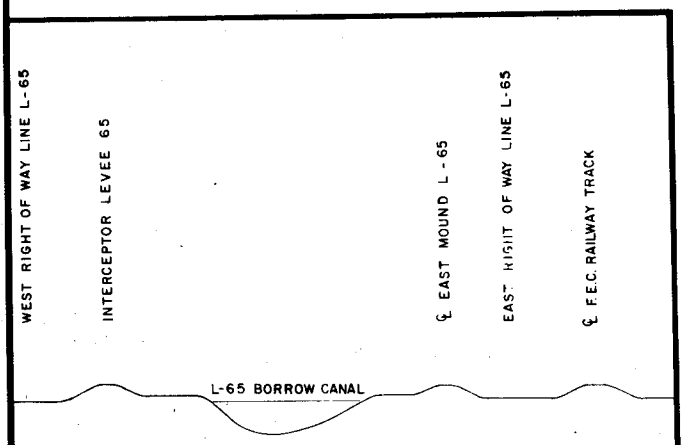


PLATE 1

PLAN OF LOWER END OF LEVEE 65 SHOWING THE BREAKS IN THE EMBANKMENTS





TYPICAL SECTION OF L-65

CULVERT TABULATION

CULVERT NO.	NO. OF BARRELS	DIA. (IN.)	INVERT ELEV. (FT. M.S.L.) INTAKE	INVERT ELEV. (FT. M.S.L.) DISCHARGE	FLASHBOARD ELEVATION
6	5	72	12.5	11.5	18.5
7	1	48	14.5	13.5	18.5
8	2	60	13.5	12.5	18.0
9	1	60	13.5	12.5	18.5
10	1	60	13.5	12.5	17.5
11	1	48	12.0	12.0	19.0

ABOVE INFORMATION OBTAINED FROM CORPS OF ENGINEERS CONTRACT PLANS.

PLATE 2

S-153 OPERATION

OCTOBER 27, 1979 TO NOVEMBER 2, 1979

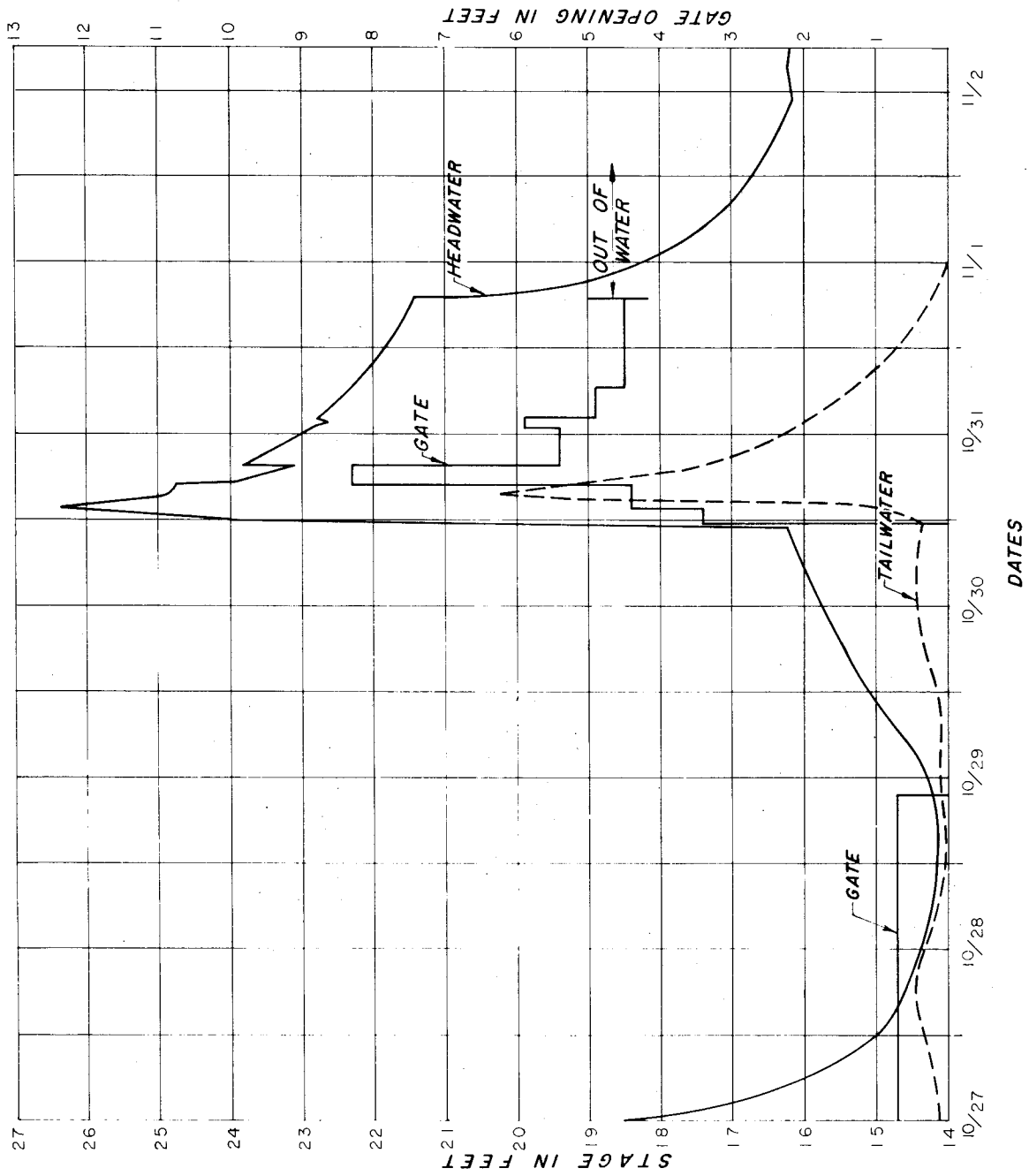


PLATE 3

APPENDIX

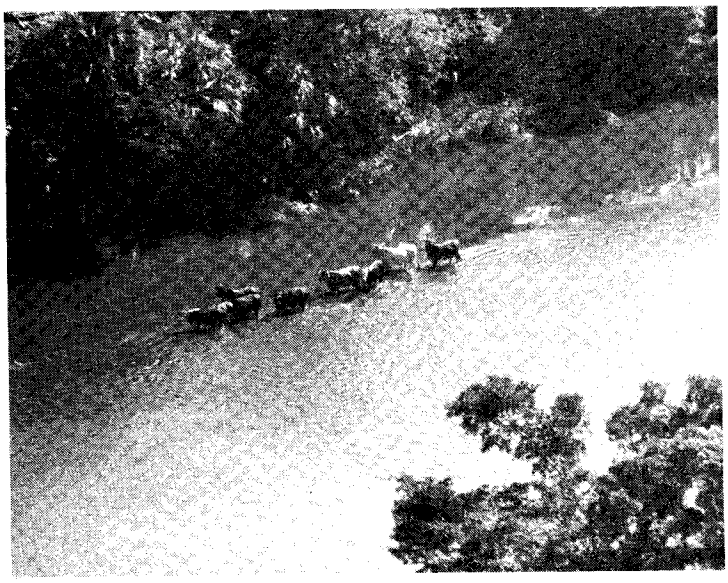
Area Photos

Copy of Agreement Between District and Florida Power & Light

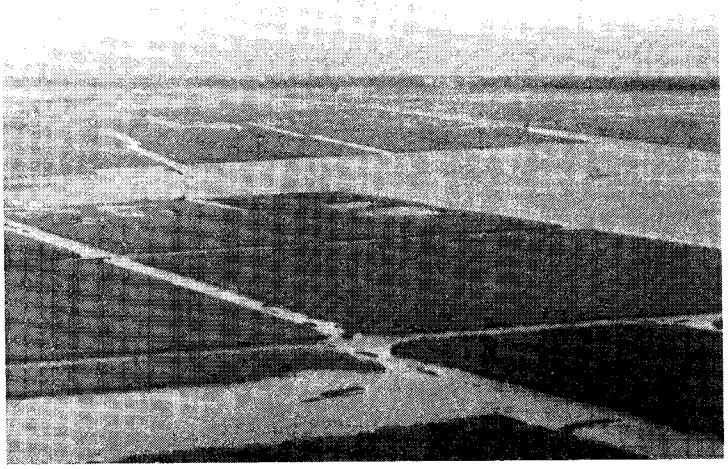
Vandalism Memos

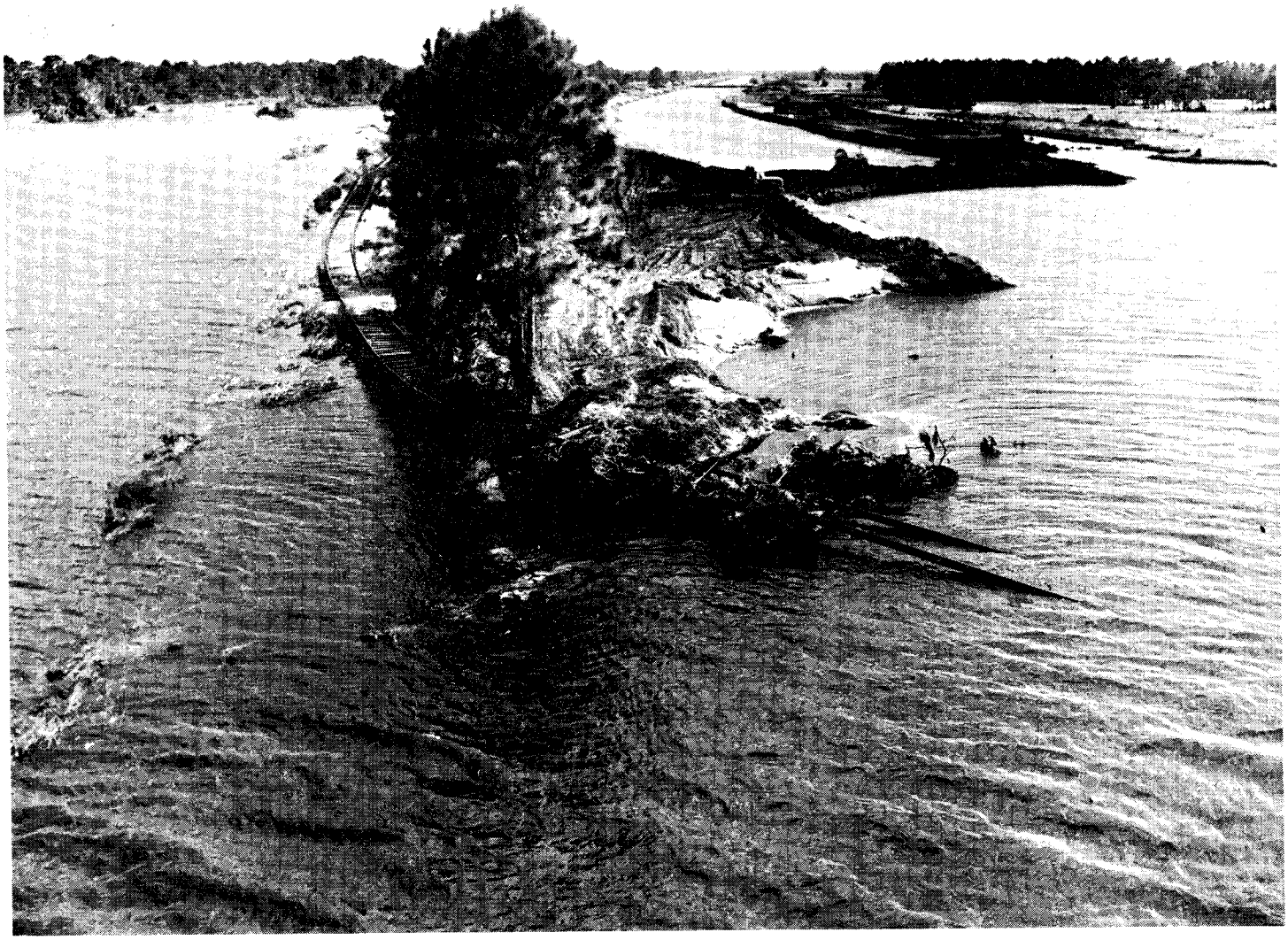

AERIAL PHOTO OF FPL COOLING WATER RESERVOIR BREAK TAKEN: OCTOBER 31, 1979
FPL COOLING WATER RESERVOIR
FEC RAILROAD
L-65 WESTERN LEVEE
L-65 BORROW CANAL
L-65 EASTERN LEVEE
FPL DIKE
FEC RAILROAD

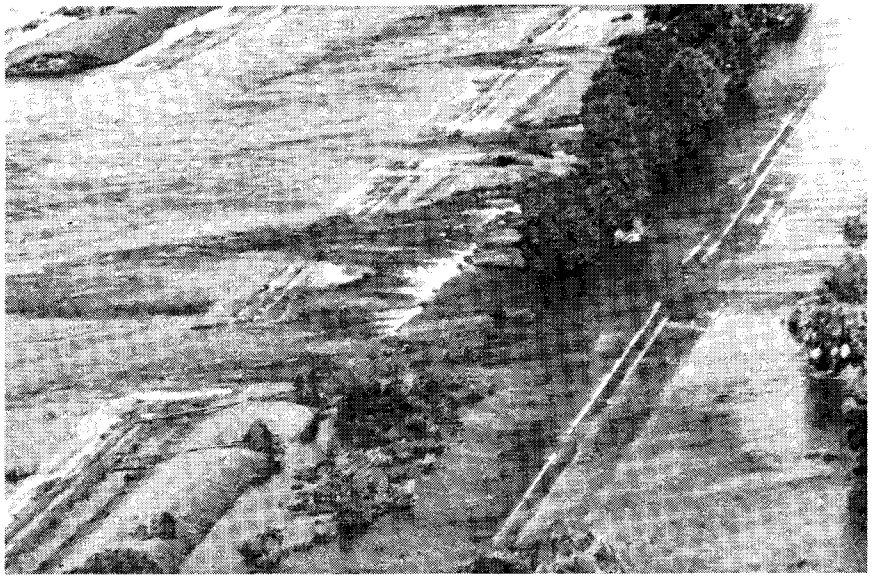
Top left: Cattle found the highest ground available, U.S. Highway 441, on October 31. Right: In some areas, sugarcane fields were totally under water. Damages to agricultural interests have yet to be totally assessed.

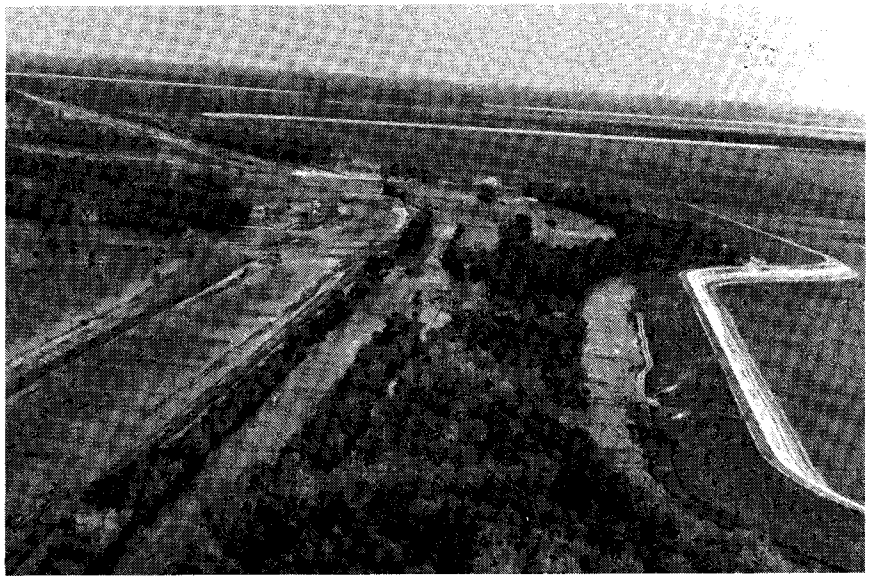


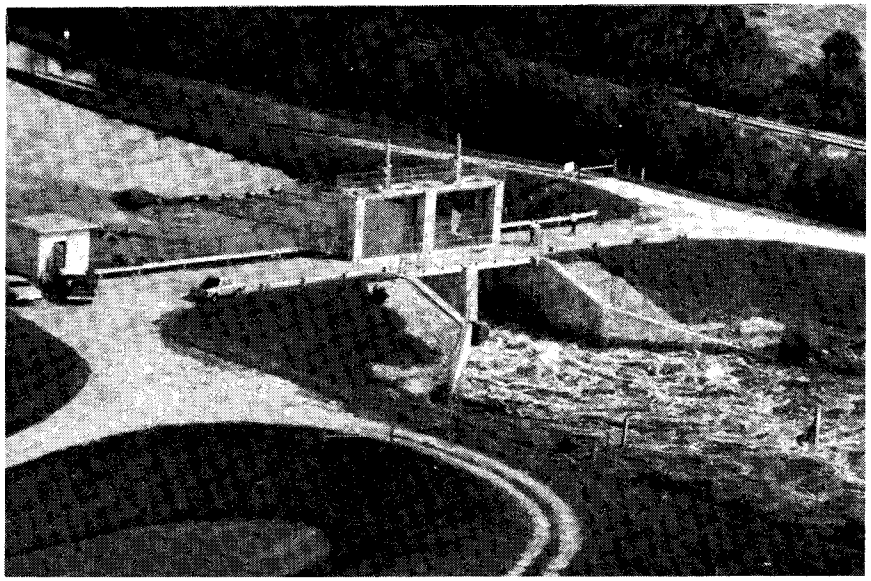
Below: This photo, taken 11/5/79, shows a portion of the severe damage to the Florida East Coast Railway. Water levels in this area have dropped from the initial flooding, but are still high.





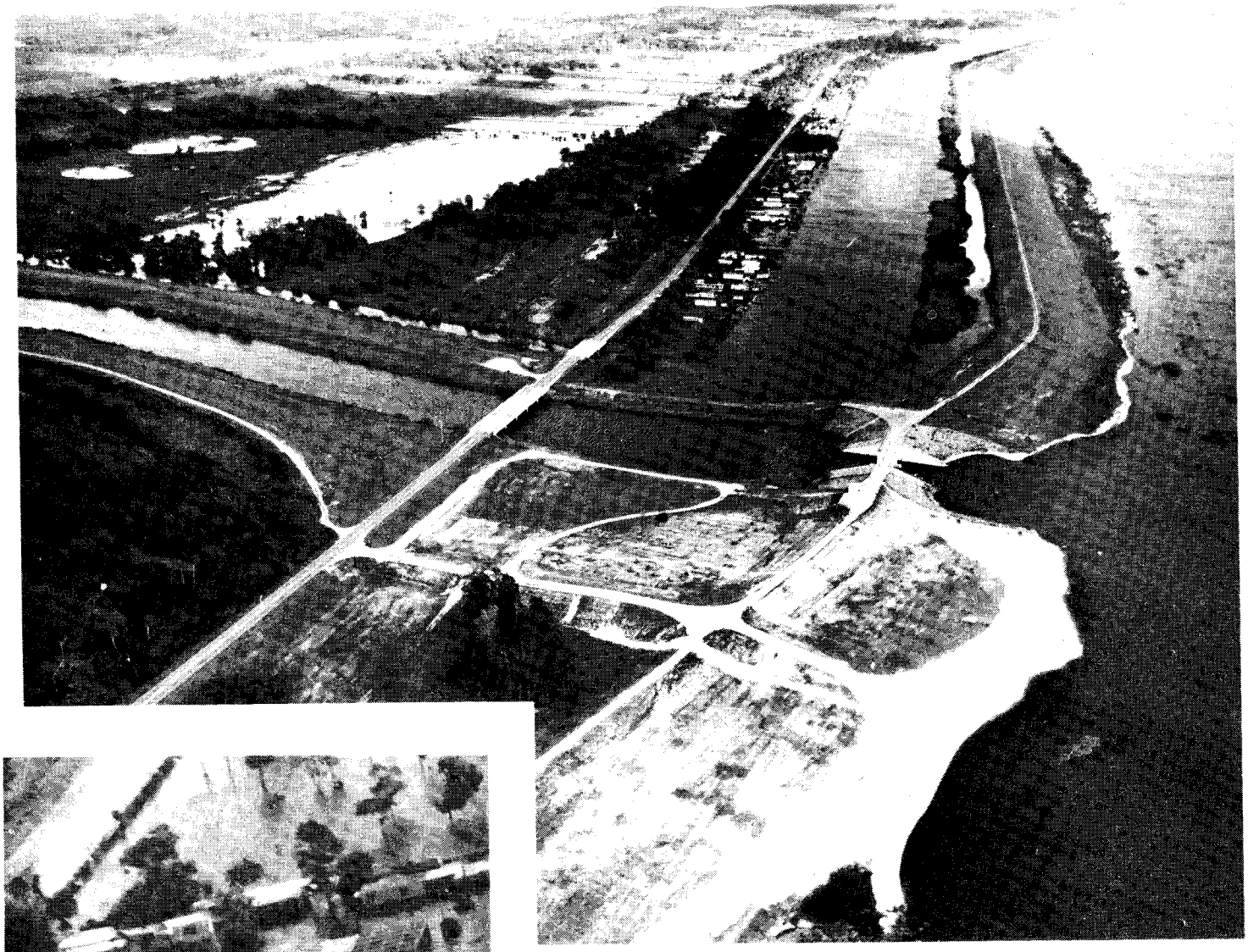


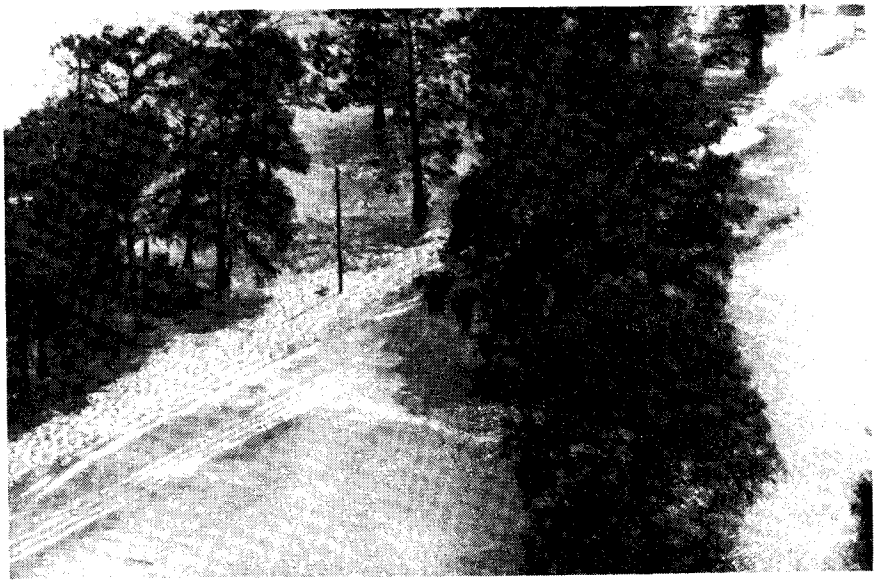




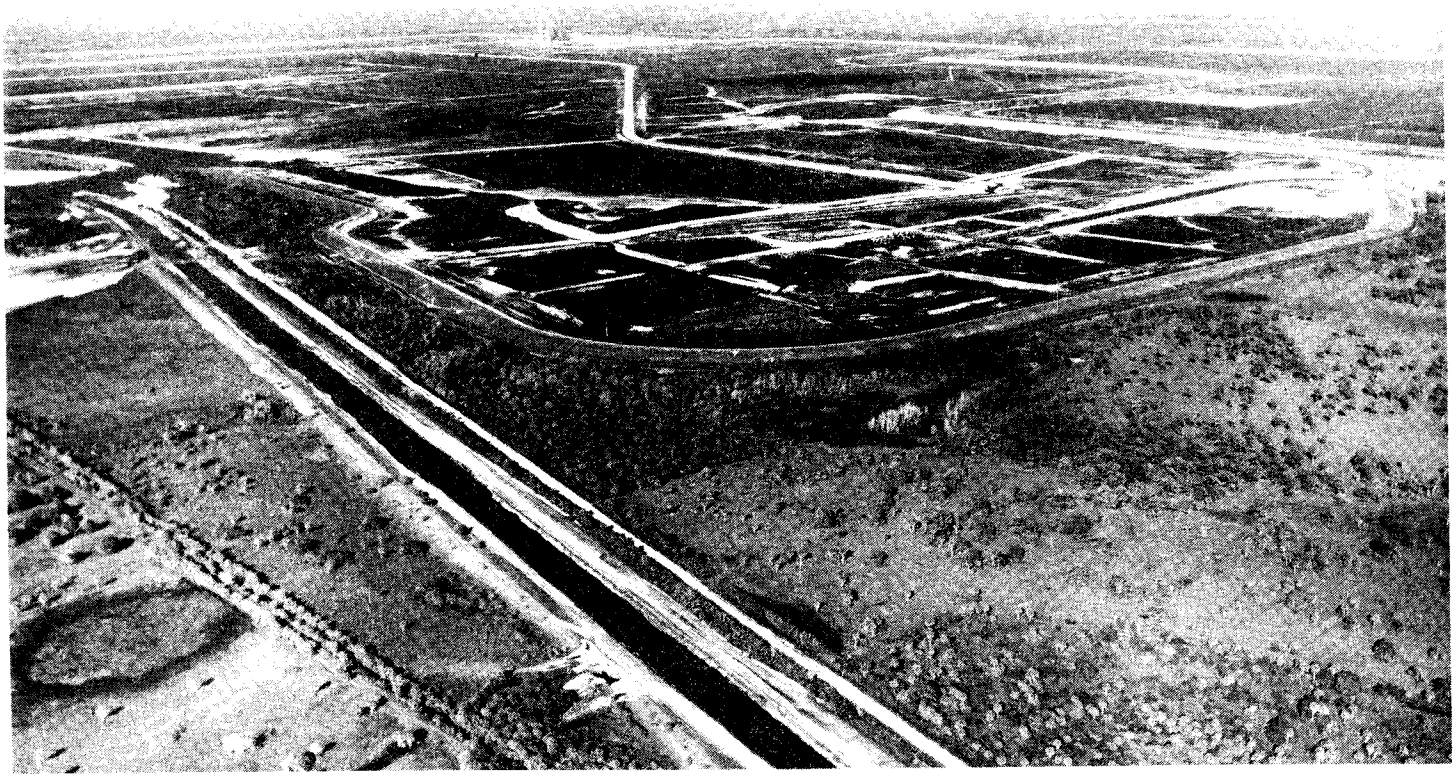
These photos, taken by District Governing Board member Robert Padrick the morning following the FPL levee break. Top left: Massive flooding is evident, along with several breaks in Project levee L-65. Top right: Another view of the breaks, looking north. Bottom left: A closer look at the break in the FPL levee, looking northwest. White area in top corner is from the levee. Bottom right: Extremely high velocisities on the discharge side of S-153, with water entering the St. Lucie Canal.

Top: Canal 59 and Structure 191 form the northern boundary of the flooding. Photo, taken 11/5/79 shows water pocketed in low areas, including a mobile home community on the L-47 borrow canal. Left: Mobile homes flooded 10/31/79. Right: Water ripples off of U.S. Highway 441 as the roadway disappears under several feet of water (10/31/79).

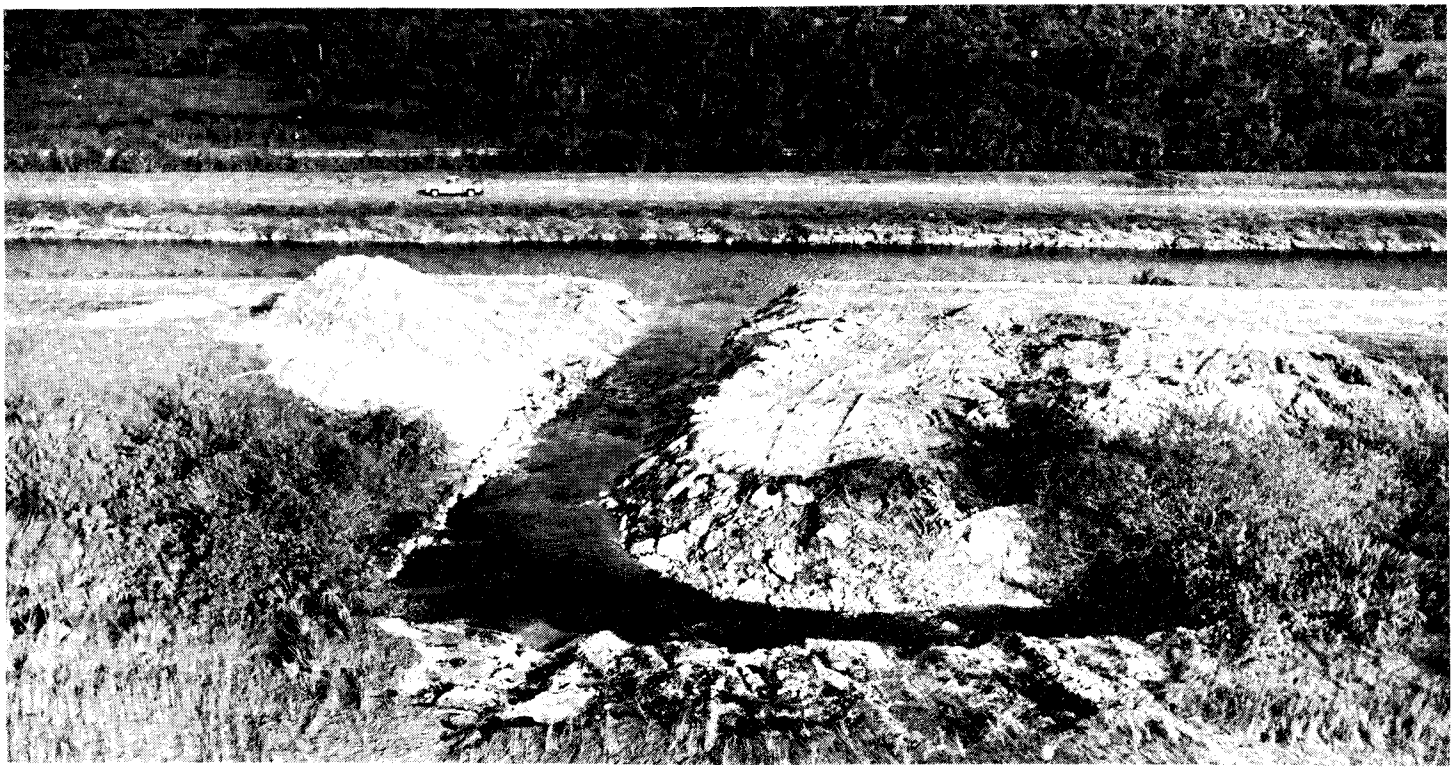




Top: The FPL reservoir as of 11/5/79, looking north. L-65 and FEC railway in foreground. Bottom: A closer look at the major dike breaks, as of 11/5/79, looking south, with L-65 at right of photo.



District field crews broke through L-65 on November 2 to provide additional inflow into the L-65 borrow canal. Previously, water had been trapped on the west side of the levee with little access to the drainage facilities. Top: looking westerly; bottom: a closer look. Photos taken 11/5/79.



PERMIT AGREEMENT

THIS AGREEMENT, made and entered into this the 8TH day of JUNE, A. D., 1973, by and between CENTRAL AND SOUTHERN FLORIDA FLOOD CONTROL DISTRICT, a public corporation of the State of Florida, hereinafter designated as "DISTRICT", and FLORIDA POWER & LIGHT COMPANY, a Florida Corporation, hereinafter designated as "COMPANY".

W I T N E S S E T H:

WHEREAS, "DISTRICT" is a resources management agency in central and southern Florida; and

WHEREAS, "COMPANY" is a Florida public utility corporation engaged in the business of generating and distributing electricity to its customers within the State of Florida; and

WHEREAS, management of the water resources for the benefit of all the inhabitants of central and southern Florida is a primary responsibility of "DISTRICT" and is a matter of public interest; and

WHEREAS, meeting the demand for an adequate reliable economical supply of electric power in the area served by "DISTRICT" is a primary responsibility of "COMPANY" and is a matter of public interest; and

WHEREAS, central and southern Florida has experienced both extreme excesses of water and drastic droughts in years past and such variations in water availability can be expected in the future; and

WHEREAS, "COMPANY" proposes to build an electric power generating plant in Martin County, Florida, which shall be hereinafter designated as "MARTIN PLANT" (Project Seminole); and

WHEREAS, an adequate water supply is essential for reliable operation of "COMPANY'S" electric power generating plant; and

WHEREAS, "COMPANY" proposes to construct, operate and maintain a reservoir to provide a cooling system for "MARTIN PLANT" (Project Seminole); and

WHEREAS, "COMPANY" requires water from "DISTRICT'S" system out of Canal 44 (St. Lucie Canal), a work of "DISTRICT", for "MARTIN PLANT" (Project Seminole) for:

a. the initial filling of the "COMPANY" reservoir, and

b. the replacement of such water as is needed from time to time to replace the net evaporation loss from said reservoir, said replacement not to exceed 50,000 acre feet in any one year, and

c. the replacement of such water as is needed from time to time to replace water lost due to seepage from said reservoir, which seepage is returned to "DISTRICT'S" system, by means, mechanical and natural, satisfactory to "DISTRICT", and

d. the replacement of such water as is needed from time to time to replace deferred makeup of the net evaporation loss to replenish the storage "reserve" in said reservoir, said reserve being 40,000 acre feet; and

WHEREAS, "COMPANY" has applied to "DISTRICT" for a permit to withdraw water from "DISTRICT'S" system out of Canal 44 (St. Lucie Canal), a work of "DISTRICT"; and

WHEREAS, pursuant to notice and a public hearing conducted by the Executive Director of "DISTRICT" in West Palm Beach, Florida, on October 26th, 1972, the staff of "DISTRICT" recommended to the Governing Board of "DISTRICT" that a permit be granted to "COMPANY" for the withdrawal of water; and

WHEREAS, the Governing Board voted unanimously in West Palm Beach, Florida, on December 15th, 1972, to allocate the necessary water and to issue a permit for such withdrawals in accordance with an agreement to be entered into between "DISTRICT" and "COMPANY"; and

WHEREAS, the regulated water level of Lake Okeechobee is presently 13.5 feet msl to 15.5 feet msl; and

WHEREAS, in order to effectively keep pace with the demand of water users in south Florida, "DISTRICT" has determined it is necessary to raise the regulated water level of Lake Okeechobee to 15.5 feet msl - 17.5 feet msl; and

WHEREAS, the Governing Board of "DISTRICT" has adopted Resolutions, numbered 433, 446, 473, 492, 503, 526, 666, 836, 849, 860 and 889, all of which authorize acquisition of lands necessary to construct the works required to raise the regulated water level of Lake Okeechobee; and

WHEREAS, "DISTRICT" has acquired the lands necessary to construct the works required to raise the regulated water level of Lake Okeechobee; and

WHEREAS, "DISTRICT" is actively engaged in a program of construction which is necessary to raise the regulated water level of Lake Okeechobee; and

WHEREAS, approximately 90% of the works necessary to raise the regulated water level of Lake Okeechobee have already been constructed, or are in the process of completion at the present time; and

WHEREAS, at the present rate of appropriation of funds and present progress of construction all works necessary to raise the regulated water level of Lake Okeechobee will be completed in 1976.

NOW, THEREFORE, the parties hereto do hereby agree as follows:

1. This Permit Agreement shall become a part of a permit by "DISTRICT" to "COMPANY" for the withdrawal of water from "DISTRICT'S" system out of Canal 44 (St. Lucie Canal) for "MARTIN PLANT" (Project Seminole) for:

   a. the initial filling of the "COMPANY" reservoir; and

   b. the replacement of such water as is needed from time to time to replace the net evaporation loss from the reservoir, said replacement not to exceed 50,000 acre feet in any one year; and

c. the replacement of such water as is needed from time to time to replace deferred makeup of the net evaporation loss to replenish the storage "reserve" in the reservoir, said reserve being 40,000 acre feet.

2. No permit is required for the replacement of water lost due to seepage from the reservoir which seepage returns to "DISTRICT'S" system, because same shall by design and the operation plan for said reservoir be a non-consumptive use of water resources.

3. After prior notice to, and approval of "DISTRICT" (which approval shall be evidenced by issuance of a Permit under conditions to be imposed by "DISTRICT"), "COMPANY" and its agents, employees, workmen, contractors or subcontractors may enter upon "DISTRICT'S" right of way along Levee 65, the access road and bridge to U.S. #441, and other rights of way of "DISTRICT" for the purpose of implementing the construction, operation and maintenance of said reservoir and its appurtenant facilities.

4. "COMPANY" shall submit to "DISTRICT" for "DISTRICT'S" approval, prior to calling for bids for the work necessary to implement construction of said reservoir, all plans and specifications for the construction of said reservoir, levees, pumping station and canals, and shall submit a plan of operation and maintenance of said reservoir and pumping station prior to operation and maintenance of same. "DISTRICT" shall have thirty (30) days after receipt of said plans and specifications within which, in writing, to approve same or to request changes; if "DISTRICT" fails to respond within thirty (30) days, this shall constitute approval of said plans and specifications. In the event of a request by "DISTRICT" for changes in such plans and specifications or plan of operation and maintenance of said reservoir and levees, which changes are necessary to effectuate present and future responsibilities of "DISTRICT" and which are economically feasible and in accord with sound engineering practice, such changes shall be made. "DISTRICT" personnel may conduct periodic inspections during the construction of said reservoir, levees, pumping station and canals, and if such inspections by "DISTRICT" determine the work is not in compliance with the approved plans and specifications, "COMPANY" upon prior written notification from "DISTRICT", will correct deviations in construction or maintenance from approved plans and specifications as may be required by "DISTRICT".

5. "COMPANY" will furnish to "DISTRICT", in such form as "DISTRICT" may require, periodic reports on the maintenance and operation of said reservoir system. Such reports shall include information derived from the Aquatic Weed Control Management Program (AWCMP) performed at "COMPANY'S" expense as described in "COMPANY'S" February 1973 Martin Plant Environmental Impact Statement, which includes funding of an in-depth study of the state of the art and

preparation of a report entitled "An Evaluation of Aquatic Weed Control Methods For Power Plant Cooling Reservoirs"; based upon the conclusions and recommendations of the report, funding of applied research programs, if needed, to determine practical and economical control methods will be undertaken by "COMPANY" at "COMPANY'S" expense; based upon said report and the results of the research work, implementation of a balanced aquatic weed control program for the "MARTIN PLANT" reservoir will be undertaken by "COMPANY" at "COMPANY'S" expense.

6. The instrumentation required by "DISTRICT" to measure those parameters which must be monitored, in order to meet the requirements of the permit issued for the construction and operation of said reservoir shall be provided, installed and maintained by "COMPANY" at its own expense. It shall be understood that such instrumentation shall be in accordance with state of the art limitations and in agreement with good engineering practice standards.

7. The criteria which shall govern all withdrawals of water by "COMPANY" from "DISTRICT'S" system out of Canal 44 (St. Lucie Canal) and the consequent use in "COMPANY'S" said reservoir, shall be determined and established by "DISTRICT". With respect to said criteria and the aforesaid purposes of withdrawing water:

A. "COMPANY" will notify "DISTRICT" in writing, at least fifteen days prior to such time as it desires to begin the initial filling of its said reservoir. Upon receipt of notice from "COMPANY", "DISTRICT" will, within 30 days of receipt of notice from "COMPANY" examine water conditions in the "DISTRICT", and if, in the judgment of the "DISTRICT", such use of water is consistent with overall "DISTRICT" objective and is in the public interest, "DISTRICT" will give permission in writing to "COMPANY" to commence the initial filling of said reservoir. "COMPANY" will terminate these withdrawals when said reservoir is full and the storage "reserve" of said reservoir is filled to capacity, or within 24 hours following receipt of written notice from "DISTRICT" to so terminate and shall not thereafter withdraw water for the initial filling of said reservoir until notified by "DISTRICT" that it may again proceed to do so.

B. "COMPANY" will notify "DISTRICT", prior to commencement of withdrawals for the purpose of replacement of the net evaporation loss. "COMPANY" shall terminate withdrawals for the purpose of replacement of the net evaporation loss from said reservoir within 24 hours following receipt of notice from "DISTRICT" to so terminate and shall not thereafter withdraw water for the replacement of net evaporation loss until notified by

"DISTRICT" that it may again proceed to do so.

C. "COMPANY" will notify "DISTRICT" prior to replenishment of the storage "reserve" of said reservoir to replace deferred makeup of the net evaporation loss. "COMPANY" will terminate these withdrawals within 24 hours following the receipt of notice from "DISTRICT" to so terminate and shall not thereafter withdraw water for replenishment of the storage "reserve" of said reservoir until notified by "DISTRICT" that it may again proceed to do so.

8. The permit for withdrawal of water contemplated by this Permit Agreement, which permit shall be consistent with the terms of this Permit Agreement, shall be issued, upon proper application therefor, within 30 days after the date of application therefor. The withdrawal of water under said permit will be subject to and dependent upon the following conditions:

A. "COMPANY" having secured all applicable local, state and federal permits necessary for the construction of said reservoir system.

B. "COMPANY" having secured all applicable local, state and federal permits necessary for the discharge of water from said reservoir into Canal 44 (St. Lucie Canal). The quality of the water discharged, including temperature, must meet all permit requirements. Provided, however, in the event "COMPANY" has not received a Permit pursuant to the Federal Water Pollution Control Act (FWPCA), then a letter of intent from the appropriate permitting agency or agencies evidencing intention to grant any and all necessary permits will be accepted by "DISTRICT", pending issuance of the necessary permits.

C. "COMPANY" adhering to all present and future rules and regulations of "DISTRICT" applicable to the withdrawal of water from "DISTRICT'S" system by "COMPANY" out of Canal 44 (St. Lucie Canal), for "MARTIN" Plant.

D. "COMPANY" adhering to all present and future water quality and water use requirements applicable to the "MARTIN PLANT" by reason of any laws, rules and regulations of "DISTRICT" and any local, state or federal rules, regulations, ordinances, statutes or orders.

E. (1) Completion of Central and Southern Florida Flood Control Project Works to operate Lake Okeechobee regulation schedule between 15.5 feet msl and 17.5 feet msl.

(2) Permission from "DISTRICT" as set forth in 7(A) hereinbefore.

(3) Appropriations have been made by the Federal Government, State Government and "DISTRICT" for the purpose of raising the regulated water level of Lake Okeechobee and appropriations continue for that purpose.

In the unforseen event some delay is experienced in completion of the works necessary to raise Lake Okeechobee and "COMPANY" has proceeded to the point it is in position to fill said reservoir, "DISTRICT" may authorize "COMPANY" to initially fill said reservoir and to operate said reservoir on an interim basis, if in the judgment of "DISTRICT" such use of water is consistent with overall "DISTRICT" objectives, and is in the public interest.

9. It is the purpose and intent of the parties hereto that the use of water from "DISTRICT'S" system , as provided by this Permit Agreement, shall be continuing and permanent; provided, however, notwithstanding any of the provisions contained herein, this Permit Agreement shall not estop or in any way prevent "DISTRICT" from the further regulation of said withdrawals provided for herein as "DISTRICT" is authorized and directed to do under and pursuant to the laws of the State of Florida.

10. "COMPANY" assumes all responsibility for, and shall save harmless "DISTRICT" against all claims or demands whatsoever for damages or for compensation for injuries to persons, animals and property due or claimed to be due either directly or indirectly to "COMPANY'S" operations, or to the act, or omission to act, of or by "COMPANY", its agents, employees, workmen, contractors or sub-contractors which "COMPANY" may employ, arising out of the establishing, constructing, or using of said reservoir, pumping station supplying said reservoir, or appurtenant facilties for said reservoir, or from any leaks or breaks or spillovers from said reservoir or through, around or under the dikes, levees and embankments of said reservoir, regardless of whether or not caused by negligence attributable to "COMPANY". Should any such aforesaid claims or demands be filed in any court of law as a suit or suits, all damages obtained against "DISTRICT" by reason of any accident, accidents, injuries, or damages, in any such suit or suits at law against "DISTRICT" including legal fees, court costs and other legal expenses shall be paid by "COMPANY", which shall have the right to join in the defense of such suit or suits after written notice to "COMPANY" by "DISTRICT" of the existence of same.

11. This Permit Agreement and the permit for the withdrawal of water constitutes the entire agreement between the parties hereto, and any change, supplement, modification or correction in this Permit Agreement must be in writing and signed by the parties hereto.

IN WITNESS WHEREOF, the parties to this Permit Agreement have hereunto set

their hands and seals the day, month and year first above written.

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

(Corporate Seal)

Robert K. Clark
Chairman

ATTEST:

Secretary

Executed in the presence of:

Robert Grafton

Wanda K. Bonnell

AS TO "DISTRICT"

FLORIDA POWER & LIGHT COMPANY
a Florida Corporation

(Corporate Seal)

By
(Title) VICE PRES.

ATTEST:

(Title) ASSISTANT SECRETARY

Executed in the presence of:

AS TO "COMPANY"

Noted, FM...

MEMORANDUM

TO: MR. BILL BRANNEN, DIRECTOR OF FIELD SERVICES

FROM: E.W. RAULERSON SUPERINTENDENT-OKEECHOBEE F.S

SUBJECT: VANDALISM AT S-153

DATE: OCTOBER 29, 1979

On the morning of October 29, 1979 at 0930 hours, I received the water reading from S-135 who takes the reading at S-153. The water level was 14.10 and 14.04. Realizing there was a problem, an electrician was dispatched immediately to investigate . On arriving at S-153, it was found that someone (unknown) had forced the lever on the power supply far enough to shut off the power to the structure. At the time, the #1 gate was open .75 and the #2 gate was open 1.00 . This power off with the gates open prevented gates from closing. Power was cut back on and the gates closed at 1045 hours.
It is to be noted that this power box was locked, but with enough force the ears will bend and give enough movement of lever to shut off power.
Enclosed is copy of electricians report.

Respectfully,

E W Raulerson

E.W. Raulerson, Superintendent

Okeechobee Field Station
EWR/cm

Enc:

Noted..

MEMORANDUM

TO: E.W. RAULERSON, SUPERINTENDENT OKEECHOBEE F.S.

FROM: NOEL CHANDLER, ELECTRICIAN I, OKEECHOBEE F.S.

SUBJECT: VANDALISM AT S-153

DATE: OCTOBER 29, 1979

I, Noel Chandler, Electrician I, was called out to a problem at S-153 at about 9:30 A.M. on October 29, 1979.
When I arrived at S-153, we checked for power inside the control house and all power was off. I went outside where the main power supply is located and the lever was pulled down enough so that the blades were not engaged with the power source. The lever was locked and the box was locked, but the tabs holding the lock and lever were bent down with force so as to disengage the power.
My helper, Dirk Whitlock was also with me and assisted in my work. When we reset the power supply, we checked all power and it was all normal. We lowered the gates to a closed full stage at about 10:45 A.M.

Respectfully,

Noel O. Chandler

Noel Chandler, Electrician I

Okeechobee Field Station

NAC/cm