

**COMPREHENSIVE EVERGLADES RESTORATION PLAN
CENTRAL AND SOUTHERN FLORIDA PROJECT**



**H EXISTING CONDITIONS
H.6 WATER MANAGEMENT**

**EVERGLADES AGRICULTURAL AREA
STORAGE RESERVOIRS – PHASE 1**



**US Army Corps of Engineers
Jacksonville District**



**South Florida Water
Management District**

Assisted By:



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(SFWMD Consultant Task 4.1.4.2)

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H EXISTING CONDITIONS

H.6 WATER MANAGEMENT

H.6.1 INTRODUCTION

The development of agriculture within the Everglades Agricultural Area (EAA) was substantially completed in 1962 and covers an area of 1,181 square miles (3,059 km²). It is located below the southeastern border of Lake Okeechobee and extends to Water Conservation Area 1 (WCA-1 or the Arthur R. Marshall Loxahatchee National Wildlife Refuge) in western Palm Beach, Martin, Hendry and Glades counties. The Water Management System (WMS) of the Everglades Agricultural Area (EAA) is a complex network of canals, levees, culverts, sluice gates, and pumps. It is operated with the goal of providing flood protection, irrigation, and fresh water, for the EAA and the surrounding environmentally sensitive areas.

Hydrography, drainage basins, water management practices, and major groundwater/hydro-geologic features in the study area are described in this report. Hydrologic data was compiled and evaluated in a summary of the existing flow regimes in the study area. A description is given for major EAA structures including the structure type, location, primary function, secondary function, and any general notes regarding the structure purpose and management. Major canals such as the boundary L-series canals (Miami, North New River, Hillsboro, and West Palm Beach) are also described regarding location, primary function, secondary function, and general notes.

H.6.2 EXISTING WATER MANAGEMENT SYSTEM

H.6.2.1 Hydrography

Sugar cane is the primary crop grown in the EAA, with relatively smaller crops of vegetables (winter vegetables, rice, etc.) and sod. More than 50% of the sugar produced nationally is harvested in the EAA. Fifteen project canals and over 40 control structures, which are managed by the South Florida Water Management District (SFWMD), serve the EAA. The Rotenberger and Holey Land Wildlife Management Areas (WMA), as well as the stormwater treatment areas (STA) are contained within the EAA.

The EAA was formally designated in the latter part of the 1950s. The extremely rich soils of the area made the region very attractive to farmers. During the period from 1906 to 1927, approximately 78 square miles (202 km²) were farmed. Production soared during the agricultural boom of the 1950s. By 1973, there were 120 sugar cane farms, which covered 313 square miles (809 km²), and produced 800,000 tons (726,000 metric tons) of sugar. In the following two years, sugar cane crops accounted for 469 square miles (1,214 km²) of the EAA. Today, approximately 898 square miles (2,327 km²) of the EAA are farmed for sugar cane.

Runoff in the EAA and overflow from Lake Okeechobee once flowed at relatively low rates south toward Water Conservation Areas (WCA), the Everglades National Park (ENP), and

ultimately Florida Bay. The existing EAA system runoff is quickly collected and routed to WCA for flood control purposes. Most of the Lake Okeechobee overflow is released in estuaries both east and west for flood control.

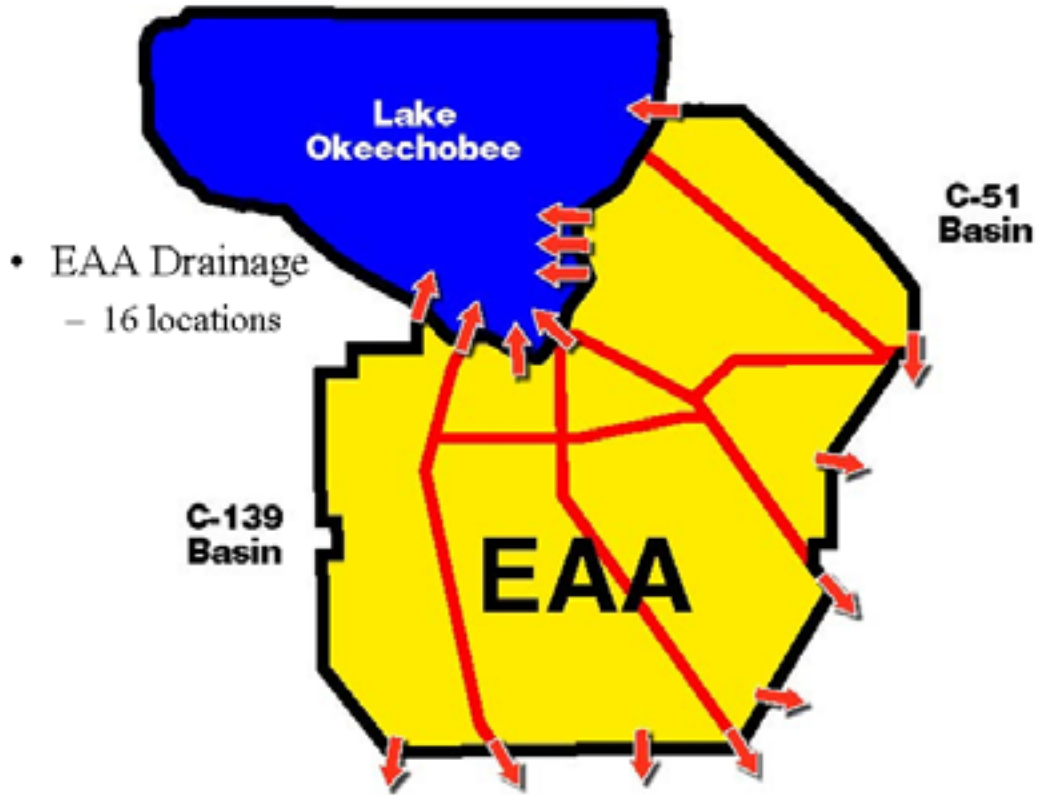


Figure H.6.1.1 Overall EAA Drainage

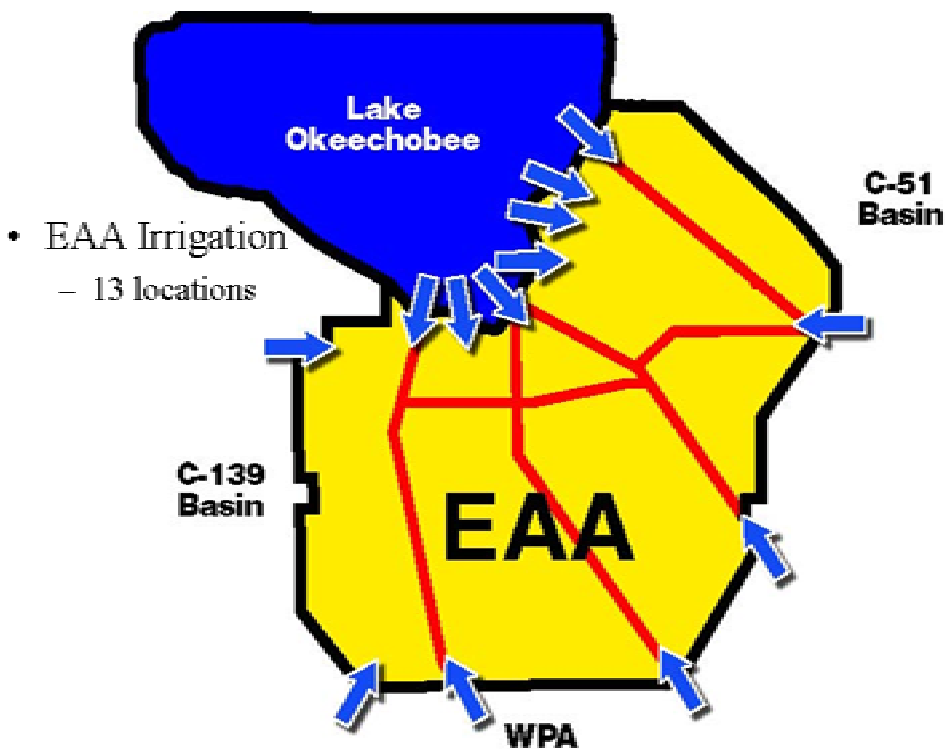


Figure H.6.1.2 –Overall EAA Irrigation Sources

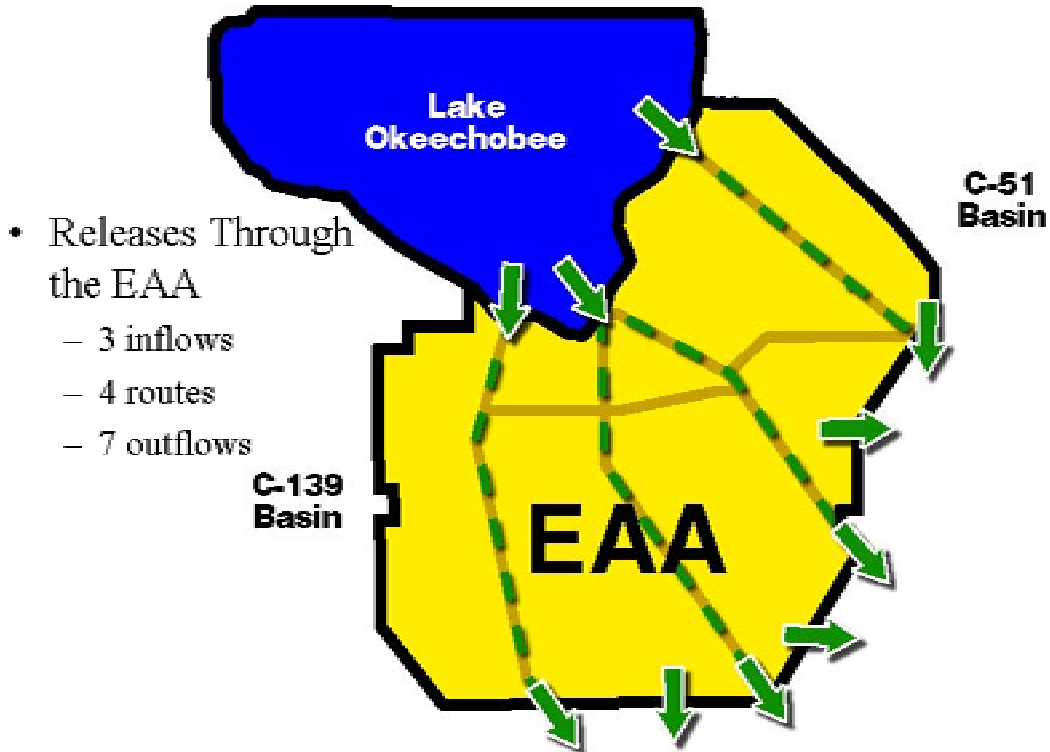


Figure H.6.1.3. Releases Through the EAA

H.6.2.2 Major Groundwater and Hydrogeologic Features

Lake Okeechobee and much of the Everglades are underlain by peat and muck that developed under prolonged flood conditions over the Fort Thompson Formation of Pleistocene sand, shell, and limestone. The loss of peat soils due to erosion, consolidation and oxidation has resulted from drainage activities. The EAA water management operations have resulted in major changes in the timing and quantity of water entering the WCA, the ENP, and bays. Compared to pre-drainage system, damaging flows to estuaries, higher stages in the WCA during wet periods, and lower stages in the WCA during dry times have resulted from the EAA water management operations.

Three principal aquifers in the EAA are the Biscayne Aquifer, the Undifferentiated Surficial Aquifer (USA), and the Upper Floridan Aquifer. The USA is a non-artesian fresh-water aquifer present in most of Palm Beach County. In general, this aquifer consists of unconsolidated sand, shelly sand, and shell. In Palm Beach County, this aquifer has areas made up of limestone beds. The USA is up to 250 feet thick with transmissivity values as high as 50,000 square feet per day. The USA is a major source of groundwater in Palm Beach and Hendry counties.

The Biscayne Aquifer is a non-artesian, highly permeable fresh-water surficial aquifer located from the lower quarter of Palm Beach County southward through to Dade County. This aquifer consists of limestone and sandy limestone and is from 100 to 400 feet thick. Transmissivity values greater than 1,000,000 square feet per day were calculated. A thick confining clay layer underlies the Biscayne Aquifer, separating it from the underlying Floridan Aquifer.

The Floridan is much deeper than and underlies the Biscayne and the USA. In south Florida, the Floridan contains brackish water and is subdivided by a series of confining clay layers, the Upper Floridan and Lower Floridan Aquifers. The Floridan has a thickness of roughly 100 to 500 feet and the depth to the upper boundary that varies from about 400 to 1,000 feet deep. The Upper Floridan transmissivities vary between 10,000 and 50,000 square feet per day in Palm Beach and Dade counties and 100,000 and 250,000 square feet per day in regions just east of Lake Okeechobee. The Lower Floridan begins at depths ranging from 1,000 to 1,800 feet and ends at depths ranging from 3,000 to 3,500 feet.

Additional geologic and hydrogeologic information on the EAA can be found in appendix B.2.6 Preliminary Seepage Consideration Report.

H.6.2.3 Drainage Basins and Water Management Practices

The following is a structure by structure description of various components of the EAA WMS and their functions. Most structures were in place prior to the inception of the Everglades Construction Project (ECP), however some components are post ECP and are noted as such. Additional information on many of the structures of the EAA may be found in the *2000 Water Control Plan for Lake Okeechobee and Everglades Agricultural Area*, and in the *1996 Master Water Control Manual for Lake Okeechobee and Everglades Agricultural Area*.

H.6.2.3.1 West Boundary (L-1, L-2, L-3, L-4 Canals)

L-1, L-2, L-3 Canals

Description – Exterior borrow canals flowing north to south along the west boundary of the EAA. L-1 begins at Lake Okeechobee in the northwest corner of surface water management basin S-4 by way of S-235. L-2 connects L-1 and L-3 along the western boundary of surface water management basins S-3 and S-8. L-3 ends at S-239 near the Hendry and Palm Beach county lines.

Primary Function – These canals provide drainage for a portion of the S-4, S-3 and S-8 surface water management basins.

L-4 Canal

Description – The L-4 borrow canal is aligned east-west along the south boundary of the basin west of the Miami Canal. It connects the L-3 borrow canal to the Miami Canal. The L-4 borrow canal is connected to the L-3 borrow canal by way of G-88 at the intersection of the Palm Beach, Broward, and Hendry county lines. The L-4 borrow canal connects with the Miami Canal near S-8 via culvert G-357 and pump G-404, 15 miles west of US Highway 27 on the Palm Beach / Broward county line.

Primary Function – This canal drains the S-8 surface water management basin and connects the western boundary canals of the EAA with the Miami Canal.

G-136

Description – This structure is a three-barreled 84-inch corrugated metal pipe culvert, located at the bend in L-1 about three miles north of SR 832.

Primary Function – This structure permits discharge from the L-1 Canal into the Miami Canal via the L-1E Canal during periods of excessively high stages.

G-150

Description – This structure is a three-barreled corrugated metal pipe culvert, located at the dividing line between L-1 and L-2. Slide gates at the south side of the culverts affect control.

Primary Function – This structure controls flow between L-1 and L-2.

Note – The operational objectives of this structure have been developed from multiple lawsuits against the SFWMD by Jackman Ranch. Its purpose is to prevent flows from the south exacerbating flooding problems in the L-1 angle area.

G-600

Description – Discharges from approximately 10,400 acres of sugar cane are pumped into STA-6 by US Sugar Corporation's (USSC) existing main pump station (Inflow Pump Station G-600). G-600 consists of five diesel pumps with nominal capacities of 100 cubic feet per second (cfs) each (500 cfs, total). Upon demand, two irrigation pump stations, with a combined capacity of 294 cfs, draw water from the L-4 Canal through the STA-6 supply canal via G-604 (five 48-inch diameter culverts with flap gates) and two culverts located just west of G-600.

Primary Function – This pump station discharges from USSC Unit 2 development to STA-6.

G-88

Description – This structure is a culvert in the alignment of the L-3 borrow canal at the intersection of L-3 and L-4 at the northwest corner of WCA-3A. Control of flow at this structure is by riser and stoplogs.

Primary Function – The structure is operated as a weir to control water levels upstream in the L-3 borrow canal.

G-155

Description – This is a concrete structure with fourteen bay weir located at the northwest corner of WCA-3A. Control is affected by flashboards.

Primary Function - The L-1/L-2/L-3/L-4 borrow canal terminates at this structure which, with G-88 and G-89, determines how flows in the borrow canal will be discharged. During the dry season, this structure prevents over-drainage in the borrow canal.

Note – During the dry season the crest of the boards are set at maximum elevation of 14.5' and adjusted to maintain G-136 headwater elevation below 14'. During the wet season, boards are removed to provide flood control in the basin.

G-89

Description – This structure is a three-barreled, corrugated metal pipe culvert, located at the northwest corner of WCA-3A. Control is affected by stop logs in a corrugated metal pipe riser.

Primary Function – The L-1/L-2/L-3 borrow canal terminates at this structure which, with G-88 and G-155, determines how flows in that borrow canal will be discharged.

Note – The structure is opened during the rainy season whenever a drainage problem occurs in the borrow canal at the north end of L-1 and capacity is available at S-140.

G-409

Description – Pumping station G-409 is located in Hendry County immediately south of STA-6 in the L-3 borrow canal. The station has three 30-inch diameter vertical axial flow pumps with diesel engines. Each pump has a discharge capacity of 63.3 cfs at a total static head of 8.3 feet. The total discharge capacity of G-409 is 190 cfs. The station includes reinforced concrete intake with trash racks, and a pre-engineered metal building to house the engines and instrumentation.

Primary Function –G-409 supplies irrigation water to the Big Cypress Seminole Indian Reservation from the Miami Canal via G-404 pump station and the L-4 borrow canal (or the L-3 extension canal), west over the L-28 borrow canal to an agricultural ditch.

Table H.6.2.1: Perimeter Structures – West Boundary

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
G-136	4 ~ 72" CMP w/stop logs Invert EL=6.0 Length=91 ft	13.0	--	--	--
G-150	3 ~ 84" CMP w/ sluice gates	19.8 (south)	18.85(north)		500
G-88	3 ~ 84" CMP w/stop logs Invert EL=8.0 Length=80 ft	14.0 dry season 12.5 wet season	--	--	--

* NGVD = National Geodetic Vertical Datum

See Figures H.6.2.1 and H.6.2.2 for a legend and flow diagram schematic of the L-1, L-2, and L-3 canals.

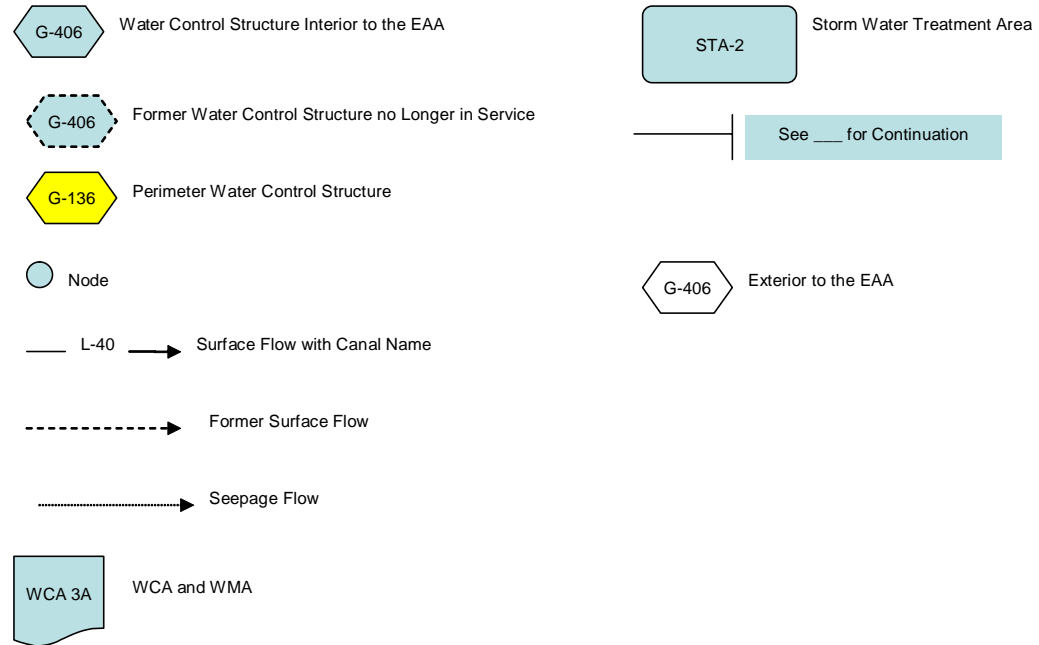


Figure H.6.2.1 – EAA Surface Water Flow Diagram Legend

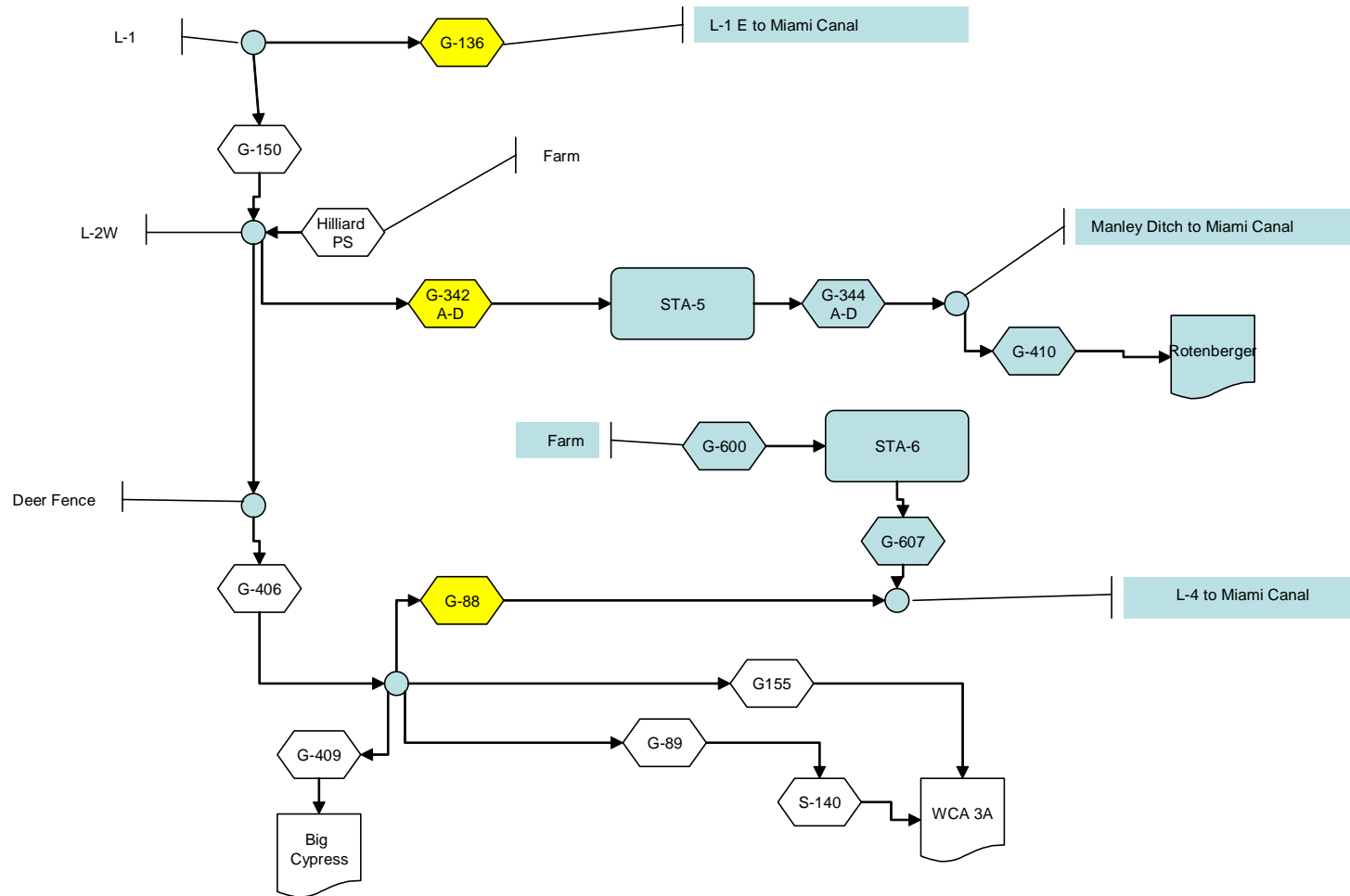


Figure H.6.2.2– L-1, L-2 and L-3 Canals – Flow Diagram

H.6.2.3.2 Miami Canal

Miami Canal (L-25, L-24, L-23)

Description - The Miami Canal connects Lake Okeechobee to WCA-3A. The connection to Lake Okeechobee is by way of S-3 at the north end of the canal near the town of Lake Harbor. The connection to WCA-3A is by way of S-8, 15 miles west of US Highway 27 on the Broward/Palm Beach county line. The Miami Canal is connected to Lake Okeechobee via gated spillway S-354 located within LD-2.

L-5 Canal

Description – This is an interior borrow canal located along the southern perimeter of surface water management basins S-8 and S-7.

Primary Function –This canal drains the S-8 and S-7 surface water management basins and connects the Miami Canal (via S-8) with the North New River Canal (via S-150).

C-3

Description – Structure C-3 is a culvert through the Herbert Hoover Dike and is located just southeast of S-236.

Primary Function – The culvert provides gravity drainage from the S-236 basin to Lake Okeechobee when the water level in the basin exceeds that of the lake.

Note – Flap gates on the lake side prevent lake water from entering the basin. The gates may be opened, however, as necessary to supply water to the basin for irrigation.

S-3

Description – This structure is a three-unit pumping plant located in the alignment of Lake Okeechobee South Shore Levee, at the intersection of the Miami Canal with Lake Okeechobee, in the western section of Palm Beach County just north of the town of Lake Harbor.

Primary Function – S-3 removes excess water from the S-3 basin and discharges it into Lake Okeechobee. The adjacent structure S-354 is closed when S-3 is pumping. Water supply releases through S-3 are by siphoning through the pumps.

Note – Because of water quality concerns in Lake Okeechobee, at present, the station is operated according to the EAA Interim Action Plan.

S-236

Description - This structure is a three-unit pumping station located on the southwest shore of Lake Okeechobee, about two miles southeast of Clewiston. The station consists of both a

pumping and outlet unit. The pumping unit is a reinforced concrete structure with a concrete block superstructure and it is on the landside of the Herbert Hoover Dike.

Primary Function – S-236 provides for drainage previously discharged directly into the lake by South Florida Conservancy District Pumping Station No. 5. This local pumping plant cannot operate efficiently with the newly authorized increase in the Lake Okeechobee regulation levels from 19.5 to 21.5 feet.

Secondary Function –S-236 pumps surplus water into Lake Okeechobee from the agricultural area generally to the southwest of the structure, in Palm Beach and Hendry counties. This surplus consists of seepage through the Herbert Hoover Dike and runoff at the rate of .75 inch per day from the 10.2 square mile tributary drainage area.

Note – Normally, pumping is initiated when the headwater reaches 9.7 feet and terminated when it reaches 7.5 feet. In response to heavy rainfall, all pumping units may be placed in operation and the stage lowered to and maintained at 7.5 feet until the storm has passed. This structure is operated and maintained by the South Florida Conservancy District.

S-354 (HG-3)

Description – S-354(HG-3) structure is a reinforced concrete, gated spillway, with two vertical lift gates, located in the Herbert Hoover Dike, at the north end of the Miami Canal at Lake Harbor. It is a replacement for Hurricane Gate Structure (HGS)-3.

Primary Function -This structure permits releases to be made from Lake Okeechobee to meet water requirements in the Miami Canal service area to the Lower East Coast and to the Everglades National Park (ENP). S-354 permits flood flows to be discharged from the EAA into Lake Okeechobee when the lake level is low. It also prevents hurricane tides from entering the Miami Canal.

Secondary Function – It is used, under certain conditions, to make regulatory or water supply releases from Lake Okeechobee into WCA-3 or the Holey Land WMA.

Note - The gates are normally closed. They are opened for the following four purposes:

- A) To meet agricultural requirements in the area served by the Miami Canal between Lake Harbor and S-8, or to meet requirements in Coastal Dade County or in the ENP. These conditions generally occur in the dry season between mid-October and mid-May. The first condition occurs under a dry season stage below 11.0 feet between S-354 and S-8, along with other factors. The second condition occurs under a dry season stage below optimum in coastal Dade County when water is not available in WCA-3. The third requirement occurs under a condition when the legally required releases to the ENP cannot be met by releases from WCA-3.

- B) To discharge flood flows from the agricultural area between S-354 and S-8 when Lake Okeechobee is low (generally below 11.0 feet). Such occasions are very rare but could occur in the late spring.
- C) To make regulatory discharges from Lake Okeechobee when conditions in the EAA will permit, and when WCA-3 is below schedule.
- D) To release water from Lake Okeechobee into the Holey Land WMA as required.

Bolles Canal (L-21)

Description – The Bolles Canal extends east to west connecting the North New River and the Miami canals. It makes an open channel connection with the North New River Canal at the intersection of State Road 827 and U.S. Highway 27, and it is connected to the Miami Canal by way of three uncontrolled 72 inch culverts.

G-372

Description – The site is located 1,700 feet east of the Miami Canal at the northwest boundary corner of the Holey Land WMA, approx. six miles north of SFWMD Pumping Station S-8 along the Miami Canal Levee Road. The pump station includes three 75 cfs seepage pumps and four 925 cfs pumps. All pumps are vertical propeller type. The 75 cfs pumps are electric and each of the remaining pumps are driven by a diesel engine through a right angle gear reducer.

Primary Function – The G-372 pump station serves as the inflow pumping station that will supply water to STA-3/4 from the Miami Canal. This water is from agricultural runoff from basins C-139, S-8, and S-3, Lake Okeechobee regulatory releases, South Shore Drainage District storm runoff and discharges, BMP makeup water, and supplemental water to prevent STA dryout.

Note – Structure G-200 and G-200 B is in the vicinity of G-372.

G-373

The G-371 and G-373 structures are not yet constructed and are currently being designed. Descriptions and specifications are not available, and could change until they go out for bid.

G-200A

Description – This structure is a three-unit pumping station at the northwest corner of the Holey Land WMA. The station is located at the east side of L-23 levee; about seven miles north of pumping station S-8.

Primary Function – G-200A is a part of the “Holey Land Flow Through Marsh” project. The purpose of this structure is to pump surplus water in the Miami canal (L-23, L-24 and L-25 canals) into the Holey Land marsh area.

Note – The structure is operated based on an agreement (C-90-1057) between the SFWMD and the Florida Fish and Wildlife Conservation Commission (FFWCC).

G-200B

The structure was removed February 21, 2002.

Description – This structure was a pumping station at the northwest corner of the Holey Land WMA, located at the east side of L-23 levee, about seven miles north of pumping station S-8.

Primary Function – G-200B is a part of the “Holey Land Flow Through Marsh” project. The purpose of this structure was to return seepage collected along the north perimeter of the Holey Land WMA.

Note – The structure was operated based on an agreement between the SFWMD and the FFWCC.

G-201

Description – This structure is a three-unit pumping station at the southeast corner of the Holey Land. The station is at the north side of L-5 levee; about nine miles east of pumping station S-8. G-201 is a part of the “Holey Land Flow-Through Marsh” project.

Primary Function – The purpose of this structure is to pump water in the seepage canal into the Holey Land marsh area.

Note – The structure is operated automatically or manually to keep the water level in the seepage canal low to avoid damage to the adjacent land.

G-204

Description – This structure is a five-barreled corrugated metal pipe culvert, located under Levee L-5. Control is affected by flashboards.

Primary Function – This structure releases water from the Holey Land WMA into WCA-3.

Note – This structure is based on an agreement (C-90-1057) between the SFWMD and the FFWCC.

G-205

Description – This structure is a six-barreled corrugated metal pipe culvert, located under Levee L-5. Control is affected by flashboards.

Primary Function – This structure releases water from the Holey Land WMA into WCA-3.

Note - This structure is based on an agreement (C-90-1057) between the SFWMD and the FFWCC.

G-206

Description – This structure is a five-barreled corrugated metal pipe culvert, located under Levee L-5. Control is affected by flashboards.

Primary Function – This structure releases water from the Holey Land WMA into WCA-3.

Note – This structure is based on an agreement (C-90-1057) between the SFWMD and the FFWCC.

G-404

Description – Pumping station G-404 is located in Broward County on the Miami Canal at the confluence with the L-4 borrow canal. The station is located adjacent to structure G-357, just north of the S-8 pump station, and adjacent to the southeastern corner of the Rotenberger Wildlife Management Area. The pump station consists of three pumps with a discharge capacity each of 190 cfs at a total dynamic head of 10.3 feet, and a static head of 8.0 feet (HW=8.0 feet; pipe crest elevation = 16.0 feet).

Primary Function – There are two operational objectives for G-404:

1. To supply the northwest corner of WCA-3A with treated discharges from STA-5, and
2. To provide supplemental irrigation water supply to the Big Cypress Seminole Indian Reservation and USSC Southern Division's Unit 2 farm.

Note – Other STA-5 related structures include G-349 A&B, G-344 A-D, G-410, G-350 A&B, G-342 A-D, G-406, G-360 A&B, G-349 B, G-348, and G-350 B. Structures G-402 A-D are located upstream of G-404.

S-8

Description – This structure is a pumping station with a gated spillway, which can control flows that bypass the pumps. The structure is located at the point where the Miami Canal enters Water Conservation Area 3A (WCA-3A), 15 miles west of US Highway 27 at the Palm Beach/Broward County line.

Primary Function – The purpose of the structure is to discharge excess drainage water via the Miami Canal, from the agricultural area north of the pumping station, into WCA-3.

Note – The gate at S-8 can release water from the Miami Canal into WCA-3A or from WCA-3A into the Miami Canal, as needed.

See Table H.6.2.2 and Figure H.6.2.3 for a description and flow diagram schematic of Miami Canal perimeter structures.

Table H.6.2.2: Perimeter Structures – Miami Canal

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
S-236	Pump Station 3 Units - 85 cfs each	7.5 (canal side)	18.5 (lake side)	HW = 7.5 - 9.7	255
C-3	Gated Culvert 2-120" CMP Invert Elev. = 5.5 ft NGVD	18.5 (lake side)	7.5 (canal side)	--	--
S-354	Gated Spillway 2-gates 23ft wide x 8.3ft high. Net Crest length = 46ft Crest elev = 3.2 ft NGVD	Water Supply 10.5 Regulatory Releases 13.2 (lake side)	Water Supply 10.0 Regulatory Releases 24.8 (canal side)	Not used to control stage	Water Supply 1450 Regulatory Releases 2000
S-3	Pump Station 3 Units - 860 cfs each	13.0 (canal side)	19.4 (lake side)	10.0-12.5 in Miami Canal	2580
S-8	Pump Station 4 Units - 1040 cfs each	12.0 (Pumped Discharge)	16.5 (Pumped Discharge)	10.0-12.5 in Miami Canal	4170 (Pumped Discharge)
	Gated Box Culvert 1-16.5ft x 14.4ft x 78.5ft Reinforced Concrete Box Invert Elev. = 0.1ft NGVD	12.0 (Gravity Discharge - EAA side)	11.9 (Gravity Discharge - WCA 3A side)		500 (Gravity Discharge)

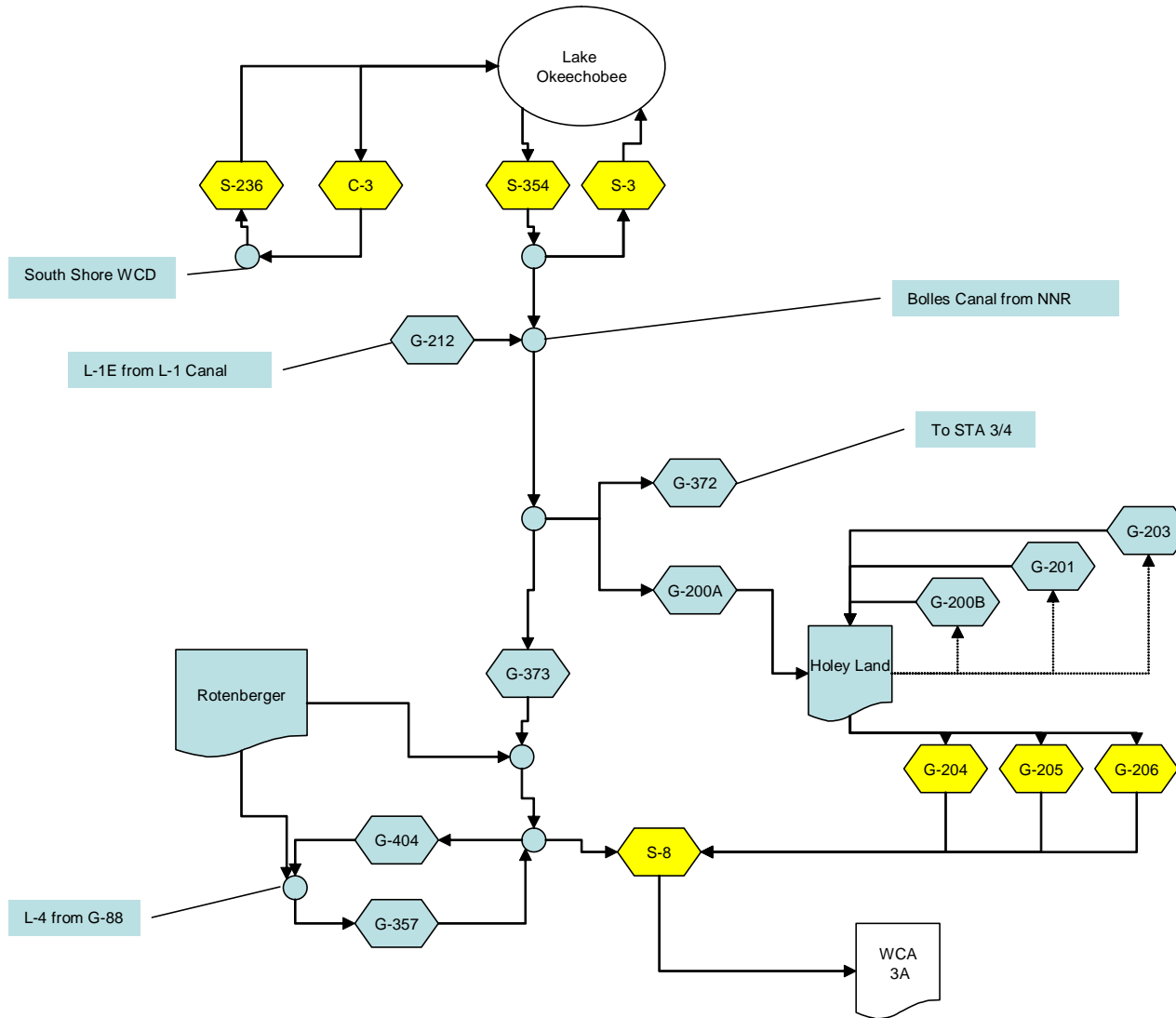


Figure H.6.2.3– Miami Canal - Flow Diagram

H.6.2.3.3 North New River Canal

North New River Canal (L-18, L-19, L-20)

Description – The North New River Canal connects Lake Okeechobee to WCA 2A and 3A. The connection to Lake Okeechobee is by way of S-2 at the north end of the canal at South Bay west of Belle Glade. The connection with WCA-2A is by way of S-7 at the intersection of L-5 and L-6, just east of U.S. Highway 27 on the Palm Beach/Broward County line. The connection with WCA-3A is by way of S-150 just west of S-7.

Note – The North New River Canal is interconnected to the Miami Canal and to the Hillsboro Canal by the Bolles Canal. These are open channel connections. Although water flow in the Bolles Canal is restricted by its shallow depth, small cross sectional area, and by culverts in its alignment (Duda Road, at a farm road on the boundary between the S-2 and S-3 basins, and at the confluence with the Miami Canal), there may be inter-basin flow of water between the S-2 and S-3 basins and between the S-2 and S-6 basins. As a result, the boundaries between these basins may vary.

Cross Canal (L-16)

Description – The Cross Canal extends east to west connecting the Hillsboro Canal to the North New River Canal. It makes an open channel connection with the Hillsboro Canal about 1.5 miles southeast of the US Highway 441 crossing of the Hillsboro Canal and it makes an open channel connection with the North New River Canal at the intersection of State Road 827 and US Highway 27. On older maps this canal is identified as the Bolles Canal.

S-2

Description – This structure is a four-unit pumping plant located in the alignment of Lake Okeechobee South Shore Levee at the intersection of the Hillsboro and the North New River Canals with Lake Okeechobee, in the western section of Palm Beach County, 3.5 miles northwest of Belle Glade.

Primary Function – S-2 pumps surplus water into Lake Okeechobee via the Hillsboro and North New River canals from the agricultural area south and east of the structure.

Note – The pumping station will be operated whenever water level at any point in the Hillsboro or North New River canals within the agricultural area south of the structure exceeds the optimum elevation of 12.5 feet unless the water level in Lake Okeechobee is low enough to permit quantity discharge into the lake through the nearby S-351 at a desirable rate. At present, the station is operated according to the EAA Interim Action Plan, and because of water quality concerns in Lake Okeechobee, S-351 is closed during S-2 pumping operations.

S-351 (HG-4)

Description – This structure is a reinforced concrete, gated spillway, with three vertical lift gates, located in the Herbert Hoover Dike, at the north end of the Hillsboro and North New River canals. It is a replacement for HGS-4.

Primary Function – This structure will permit releases to be made from Lake Okeechobee to meet water requirements in the Hillsboro and North New River service areas. It will permit flood flows to be discharged from the agricultural area into Lake Okeechobee when the lake level is low. It will also prevent hurricane tides from entering the Hillsboro or North New River canals.

Secondary Function – It is used, under certain conditions, to make regulatory releases from Lake Okeechobee into WCA-2 via the North New River Canal and WCA-1 via the Hillsboro Canal.

Note – The gates are normally closed. They are opened for the following three purposes:

- A) To meet agricultural requirements in the area served by the Hillsboro or North New River canals between Lake Okeechobee and the WCA or to meet requirements in the Coastal Area of Broward and Dade counties, ENP, etc. These requirements generally occur in the dry season between mid-October and mid-May. The former requirement is gauged by a dry season stage below 11.5 feet in the Hillsboro or North New River canals in the EAA, along with other factors.
- B) To discharge flood flows from the EAA in the Hillsboro or North New River Canal when Lake Okeechobee is low (generally below 11.5 feet). Such occasions are very rare but could occur in the late spring.
- C) When Lake Okeechobee is above schedule, when weather conditions are dry in the EAA, when canal stage in the Hillsboro and North New River canals are low (generally below 11.5 feet) and when the stage in WCA-2A is below schedule. Such occasions are also very rare.

C-4A

Description – This structure is a double-barreled corrugated culvert located between S-2 and S-3, through LD-2 levee. Control is affected by a flap gate located on the Lake Okeechobee side of the structure.

Primary Function – This structure provides flood control for the South Shore Drainage District. For drainage, water is pumped into Lake Okeechobee through the canal and this structure. The flap gates prevent water from the lake backing into the canal. The flap gate can be lifted manually to supply water to the pumping station.

Secondary Function – This structure can also be used for irrigation purposes.

Note – The structure is operated by the U.S. Army Corps of Engineers (USACE). South Shore Drainage District has a two-unit pumping station connected to this structure through a short canal.

G-370

Description – The site is located at the northeast corner boundary of STA-3/4, along the west side of US Highway 27 approximately 23 miles south Belle Glade in Palm Beach County. The pump station includes three 75 cfs seepage pumps and three 925 cfs pumps. All pumps are vertical propeller type. The 75 cfs pumps are electric and each of the remaining pumps is driven by a diesel engine through a right angle gear reducer.

Primary Function – G-370 Pumping Station serves as the inflow pumping station that will supply water to STA-3/4 from the North New River Canal. This water is from agricultural runoff from basins S-7 and S-2, Lake Okeechobee regulatory releases, and BMP makeup water.

Note – This is a Post ECP Structure.

G-371

The G-371 and G-373 structures are not constructed and are currently being designed. Descriptions and specifications are not available, and could change until they go out for bid.

S-7

Description – This structure is a pumping plant with a gated spillway which controls flows which bypass the pumps. This structure is located in the alignment of North New River Canal, at its intersection by Levees 5, 6, and 18, about 26 miles south of the town of Belle Glade and just east of US Highway 27 at the Palm Beach / Broward County line.

Primary Function –The pumping station discharges drainage water via the North New River Canal from the agricultural area northwesterly of the pumping station into WCA-2.

Note – This pumping plant may also be initiated upon request by the USACE to provide regulatory discharge from Lake Okeechobee to WCA-2A by way of S-351 and the North New River Canal when the capacity of S-7 is not needed for removal of water from the S-7 and S-2 basins. Structure 7W is a gated culvert located in the vicinity of S-7.

S-150

Description – This structure is a five-barrel corrugated metal pipe culvert, located through L-5 on the north perimeter of WCA-3, about 24 miles southeast of South Bay. Control is affected by manually operated sluice gates on the upstream side of the structure.

Primary Function – This structure, with S-8, permits release of water from Lake Okeechobee and the agricultural area south of the lake into WCA-3. Structure 150 functions in this capacity only under gravity conditions, that is, when the headwater elevation exceeds the tailwater.

Note – This structure is manually operated under either flood or normal conditions. During flood conditions the gates of this structure are opened whenever water is not needed to meet the Regulation Schedule of WCA-2A and WCA-3A is below schedule and water is available in the North New River Canal. It is also open when the tailwater elevation does not exceed the headwater elevation. During normal conditions this structure may be used to supplement the discharge of S-8 into WCA-3A, when the headwater elevation exceeds the tailwater elevation and when this discharge will not interfere with the discharge of S-7 into WCA-2A. When WCA-3A is high, S-150 can release excess water in WCA-3A into the EAA for water supply.

See Table H.6.2.3 and Figure 6.2.4 for a description and flow diagram of North New River Canal perimeter structures.

Table H.6.2.3: Perimeter Structures – North New River Canal

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
S-351	Gated Spillway 3-gates 20ft wide x 7.5ft high. Net Crest length = 60ft Crest elev = 4.5 ft NGVD	Water Supply 10.5 Regulatory Releases 24.5 (lake side)	Water Supply 10.0 Regulatory Releases 24.8 (canal side)	10.0 -12.5 in Hillsboro and North New River Canals	1500 Regulatory Releases 2400
S-2	Pump Station 4 Units - 900 cfs each	13.0 (canal side)	19.2 (lake side)	10.0 -12.5 in Hillsboro and North New River Canals	3600
C-4A	2 120" diam. Flap gates, corrugated metal culvert,				
S-150	Gated Culvert 5-84in x 92 ft CMP Invert Elev. = 3.0 ft NGVD	11.0 (EAA side)	10.0 (WCA-3A side)	Not used to control stage	1000
S-7W					

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
S-7	Pump Station 3 Units - 830 cfs each	13.0 (Pumped Discharge)	18.3 (Pumped Discharge)	10.0-12.5 in North New River Canal	2490
	Gated Box Culvert 1- 14.7ftx13.3ftx 43ft Reinforced Concrete Box Invert Elev. = 1.75ft NGVD	(EAA side)	(WCA-3A side)		400

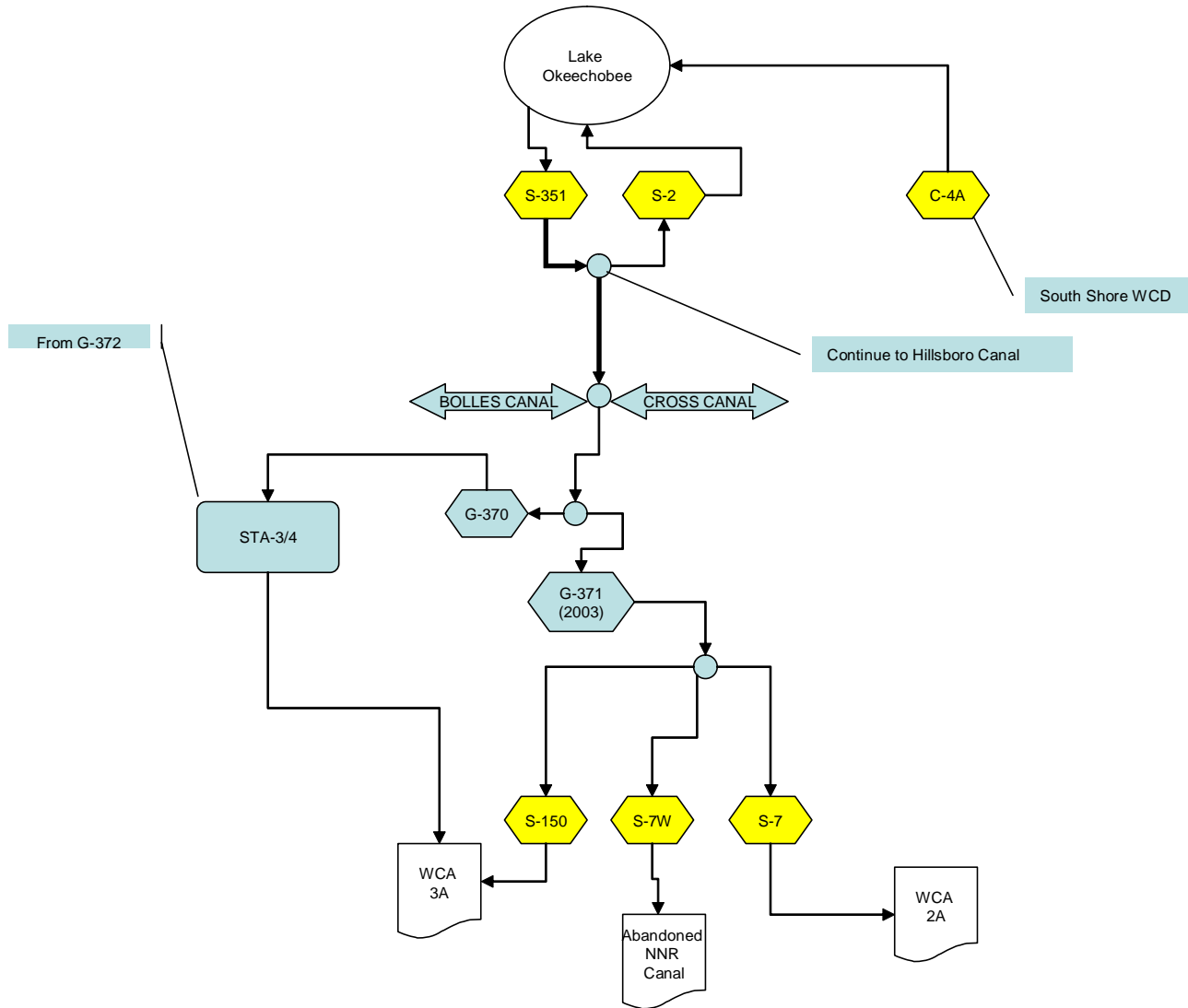


Figure H.6.2.4– North New River Canal – Flow Diagram

H.6.2.3.4 Hillsboro Canal

Hillsboro Canal (L-14, L-15)

Description – The Hillsboro Canal connects Lake Okeechobee to WCA-1. The connection to Lake Okeechobee is by way of structure S-2 at the north end of the canal at South Bay west of Belle Glade.

Note – The Hillsboro Canal is interconnected to the L-10/L-12 borrow canal (i.e., the West Palm Beach Canal) by the Cross Canal. There is a gated culvert, S-5AX, in the Cross Canal at the boundary between the S-5A basin and the S-2 and S-6 basins. When the gates on this culvert are closed, it acts as a divide between the basins. Since this structure is usually open, the Hillsboro Canal and the L-10/L-12 borrow canal are usually connected by an open channel.

C-12

Description – This structure is a three-barreled culvert located immediately downstream from the East Beach Water Control District (EBWCD) pump station.

Primary Function – This culvert is used in the withdrawal and discharge of water from Lake Okeechobee.

C-12A

Description – This culvert is a single 7' diameter culvert with a flap gate utilized for Closter Farms 100,000 gpm pump station discharge to Lake Okeechobee. (Located in Lease Parcel 3420.)

Primary Function – This culvert allows discharge when the south Closter Farms pump station cannot discharge to the East Shore Water Control District canal.

S-5AX

Description – This structure was a four-barreled corrugated metal pipe culvert, located on the Cross Canal between the Hillsboro and West Palm Beach Canals. Control was affected by manually operated sluice gates mounted on steel frames erected on the west end of each culvert. This structure was removed, in September 1999, as part of the S-5A Basin Diversion Project.

Primary Function - This structure was located at the drainage divide on the Cross Canal (the L-13 borrow canal) between the West Palm Beach Canal and the Hillsboro Canal. Its purpose was to function as a basin divide, and to channel excess water either to the Hillsboro or West Palm Beach Canals, as capacity was available.

Note – The gates on this structure were normally open. They were closed only when conditions existed such as maintenance or emergency and channel capacity was not available in the other basin to permit release through the structure.

Ocean Canal/Cross Canal (L-13)

Description – The L-13 borrow canal is the eastern reach of the Cross Canal which extends east to west connecting the L-10/L-12 borrow canal (S-5A basin) to the Hillsboro Canal (S-2 and S-6 basins).

Primary Function – The Cross Canal makes an open channel connection with the L-10/L-12 borrow canal near the intersection of US Highway 441 and US Highway 98 and an open channel connection with the Hillsboro Canal at the US 441 crossing of the Hillsboro Canal.

Note – As part of the ECP, a new divide structure (G-341) will be constructed in the Ocean Canal near the northwest corner of STA-1W. This structure will allow the diversion of a portion of the S-5A Basin runoff to STA-2 for treatment

L-6

Description – This is an interior borrow canal east of STA-2 (formerly Brown's Farm), along the southeastern boundary of water management basins S-7 and S-6.

Primary Function – This canal drains the S-7 and S-6 surface water management basins and connects the North New River Canal (via S-7) with the Hillsboro Canal (via S-6).

S-6

Description – This structure is a three-unit pumping plant located in the alignment of the Hillsboro Canal (at its intersection by Levee 6 and Levee 7) about 20 miles southeast of the town of Belle Glade in the south central section of Palm Beach County. The pumping station consists of three 135-inch diameter vertical lift pumps each rated for 975 cfs at 8.3-foot static head

Primary Function – S-6 pumps Hillsboro Canal water to STA-2. Flows originating from Lake Okeechobee, S-6/S-2 Basin, S-5A Basin diversions, East Shore Water Control District diversions, and 715 Farms diversions are pumped into STA-2 via S-6.

Note – Operation at S-6 may be initiated based on weather forecasts for the area and/or whenever the water level in the Hillsboro Canal exceeds the optimum level of 12.5 feet. However, if this excess water is needed to utilize conservation storage in Lake Okeechobee and there is available pumping capacity at S-2, back pumping at S-2, subject to the Interim Action Plan (IAP), or potential gravity discharge through S-351 may be initiated to remove floodwater from the agricultural area between S-2 and S-6 at a desirable rate. The pumping station will also be operated upon request of the USACE District Engineer, Jacksonville District, to provide regulatory discharge from Lake Okeechobee when canal capacity is not needed for removal of surplus water from the agricultural area. The pumps in this station are designed to pump drainage

water containing a negligible amount of sediment or other material that might damage the surface of the pump or the bearings. Other nearby structures includes G-328 (STA-2) and G-338.

Background Note – Because of water quality concerns, pump stations S-2 and S-3 are operated according to the EAA Interim Action Plan. The Interim Action Plan (IAP) was first implemented in 1979 to reduce the nitrogen loading to Lake Okeechobee from the EAA. The goal of the plan was to divert as much of the water as possible from Lake Okeechobee toward the WCA while still maintaining adequate flood protection in the EAA.

G-338

Description - Structure G-338 is a 14 ft. W x 12ft. H x 52 ft. L concrete box culvert with a 12.5 ft. x 14 ft. self contained vertical lift roller gate located on its upstream end. G-338 is located within the STA-2 Supply Canal; it is approximately 400 ft. downstream of S-6 and is connected to the Hillsboro Canal via a short spur canal. The structure has a design capacity of 975 cfs

Primary Function – G-338 may be operated to achieve multiple purposes:

1. To facilitate water supply delivery to downstream water users;
2. During wet weather conditions, water may be released from WCA-1 into the STA-2 supply canal for use by STA-2 and farming interests located upstream of G-328; and
3. During extreme storm events, flows from S-6 may be diverted from STA-2 through G-338 to the Hillsboro Canal.

G-339

Description – G-339 is a two-bay reinforced concrete U-shaped spillway with two 16 ft. wide vertical lift gates installed on the crest of an ogee shaped weir. The structure is located in the Supply Canal of STA-2 at the intersection with the existing L-6 Borrow Canal.

Primary Function – G-339 provides flow diversion from S-6 and G-328 to WCA-2A via the L-6 Borrow Canal. In addition, G-339 is operated to maintain water surface elevations in the supply canal upstream (north) of the structure at or below elevation 17.4 ft. NGVD.

G-328

Description – The structure consists of five diesel engine driven pumps, four 48-inch diameter outflow pumps and one 48-inch diameter inflow pump for irrigation. G-328 has a total nominal outflow (drainage to STA-2) capacity of 199,716 gallons per minute (gpm), (445 cfs) and a total nominal irrigation capacity of 50,000 gpm (111 cfs).

Primary Function - G-328 is a relocated agricultural pump station that is operated for drainage and irrigation capacity to tributary agricultural lands. (G-328 provides drainage for a total permitted area of 9,980 acres.)

Note: This structure is operated by non-district entities.

G-337

Description – G-337 is located along the STA-2 seepage canal. This pump station is equipped with three 42-inch diameter electric motor driven pumps, each providing a nominal capacity of approximately 80 cfs (240 cfs total).

Note: Operational experience has shown that the original three pump design is inadequate to isolate adjacent lands from the impacts of all water management operating in STA-2. An additional 4 units, G-337A, are being added to supplement an original design capacity.

Primary Function: G-337 provides seepage control service to those private lands north, west and south of STA-2 and its Supply Canal. G-337 and future auxiliary seepage pumps isolate water control operations so that they do not affect adjacent landowners. It discharges to the Supply Canal for STA-2.

G-329A-D

Description – Structures G-329A-D are a series of four gated culverts that serve as the inflow control structures for STA-2 Treatment Cell 1. Culverts G-329A-D each consist of 72-in. diameter corrugated metal pipe with an 11-ft. x 11ft. headwall fitted with a 72in x72in slide gate and service platform on its upstream end, and a flared end section on its downstream end.

Primary Function - Structures G-329A-D provide inflow to Cell 1 from the inflow canal of STA-2.

G-331A-G

Description – Structures G-331A-G are a series of seven gated culverts that serve as the inflow control structures for STA-2 Treatment Cell 2. Culverts G-331A-G each consist of a 66-in. Diameter corrugated metal pipe with an 11-ft x 11-ft. headwall fitted with a 66in. x 66in. slide gate and service platform on its upstream end, and a flared end section on its downstream section. These structures are located in Palm Beach county and situated generally on and surrounding the former Brown's Farm Wildlife Management AREA, WHICH is positioned immediately west of WCA-2.

Primary function - G-331A-G provides inflow to Cell 2 from the Inflow Canal of STA-2.

G-333A-E

Description – Structures G-332A-E are a series of five gated culverts that serve as the inflow control structures for Treatment Cell 3 or STA-2. Culverts G-333A-E each consist of a 66-in diameter corrugated metal pipe with a 11-ft. x 11ft. headwall fitted with a 66in x 66in slide gate

and service platform on its upstream end, and flared end section on its downstream end. The discharge rate for each structure is 220 cfs (1,099cfs total).

Primary Function – G-333A-E provide inflow to Cell 3 from the STA-2 Inflow Canal.

G-335

Description – The G-335 pump station began operations in October 2000. The station houses two 10 cylinder, opposed piston, 2-cycle diesel engines, two 6-cylinder, opposed piston, 2-cycle diesel engines and two electric motors at 200 horsepower each. The 10-cylinder engines are capable of pumping 950 cfs; the 6-cylinder engines pump 470 cfs and the electric motors pump 100 cfs.

Primary Function – Pump Station G-335 is used for STA-2 outflow.

Note – This is a post ECP structure.

See Table H.6.2.4 and Figure H.6.2.5 for a description and flow diagram schematic of Hillsboro Canal perimeter structures.

Table H.6.2.4: Perimeter Structures – Hillsboro Canal

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
S-351	Gated Spillway 3-gates 20ft wide x 7.5ft high. Net Crest length = 60ft Crest elev = 4.5 ft NGVD	Water Supply 10.5 Regulatory Releases 24.5 (lake side)	Water Supply 10.0 Regulatory Releases 13.5 (lake side)	10.0 -12.5 in Hillsboro and North New River Canals	Water Supply 1500 Regulatory Releases 2400
S-2	Pump Station 4 Units - 900 cfs each	13.0 flood discharge (canal side)	19.2 flood discharge (lake side)	10.0 -12.5 in Hillsboro and North New River Canals	3600
C-12 Box culvert w/flap gates between ESWCD and Lake Okeechobee					
C-12A Box culvert w/flap gates between Closter Farms and Lake Okeechobee					
S-6	Pump Station 3 Units - 975 cfs each	8.0-12.5 flood discharge	20.8 flood discharge	10.0 -12.5 in Hillsboro Canals	2925

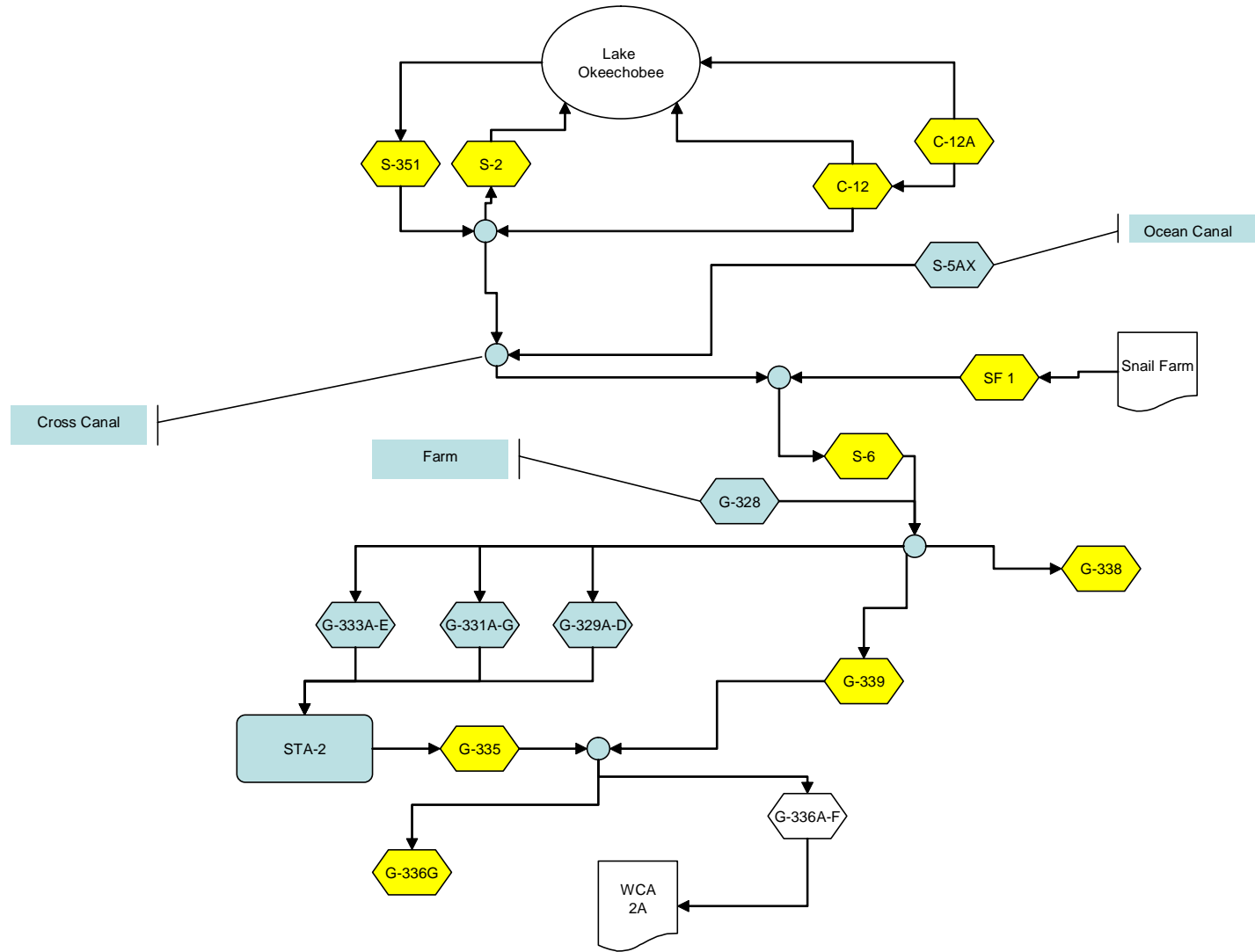


Figure H.6.2.5- Hillsboro Canal Flow Diagram

H.6.2.3.5 West Palm Beach Canal

West Palm Beach Canal (L-10, L-12, L-7 EXT)

Description – The West Palm Beach Canal starts at Canal Point along Lake Okeechobee, and flows southeast to Twenty Mile Bend.

Primary Function – This canal connects Lake Okeechobee to WCA-1. The connection of the canal to Lake Okeechobee is by way of S-352 at the north end of the canal at the town of Canal Point.

S 352 (HGS-5)

Description – This structure is a reinforced concrete, gated spillway, with two vertical lift gates, located in the Herbert Hoover Dike at the north end of the West Palm Beach Canal at Canal Point. It is a replacement for HGS-5. The structure was completed in March 1989.

Primary Function – This structure will permit releases to be made from Lake Okeechobee to meet water requirements in the West Palm Beach Canal service areas. It will permit flood flows to be discharged from the EAA into Lake Okeechobee when the lake level is low. It also prevents hurricane tides from entering the West Palm Beach Canal.

Secondary Function – It will be used, under certain conditions, to make regulatory or water supply releases from Lake Okeechobee into coastal Palm Beach County or WCA-1.

Note – The gates are normally closed. They are opened for three purposes:

- A) To meet agricultural requirements in the area served by the West Palm Beach Canal between Canal Point and S-5A, or to meet requirements in the Coastal Area east of S-5A. These requirements generally occur in the dry season between mid-October and mid-May. The former requirement is gauged by a dry season stage below 11.0 feet between Canal Point and S-5A, along with other factors. The latter requirement is gauged by a dry season stage below 8.0 feet at S-155.
- B) To discharge flood flows from the EAA between S-5A and Canal Point when Lake Okeechobee is low (generally below 11.0 feet). Such occasions are very rare but could occur in the late spring.
- C) To make regulatory discharges from Lake Okeechobee when conditions in the EAA will permit.

C-13

Description – This structure is a single barrel, 10-foot diameter, corrugated metal pipe culvert. C-13 is equipped with a manually operated slide gate on the lakeside. An elliptical liner plate was installed in 1978 to strengthen the deformed pipe. The liner plate has a vertical diameter of

6.1 feet and a horizontal diameter of 7.9 feet. The invert elevation of the pipe is 5.5 ft., NGVD. There is a short sheet pile channel extending into the lake.

Primary Function. – The slide gate can be opened to permit gravity discharge of flood water from the surrounding area if the landside stage exceeds the lake stage or it can be opened to permit the Pelican Lakes Drainage District Pump Station, which is located upstream of C-13, to pump flood water through C-13 into the lake. The slide gate can be operated to maintain desirable water levels and to supply water for irrigation and other demands in the C-13 service area from the lake.

C-10

Description – This structure is a double-barreled corrugated culvert located between S-352 and S-351 through the Herbert Hoover Dike. A flap gate located on the Lake Okeechobee side of the structure affects control.

Primary Function – This structure provides flood control and irrigation water for East Beach Drainage District.

Note – The USACE Clewiston office operates the structure. East Beach Drainage District has a pumping station connecting to this structure through a short canal. For drainage, water is pumped into Lake Okeechobee through the canal and this structure. The flap gates prevent water from the lake backing into the canal. For irrigation releases from Lake Okeechobee, the flap gate can be lifted manually to release water to the pumping station. Water can be discharged through the trough or the pump in the pumping station.

C-10A

Description – C-10A is a gated, five-barreled corrugated metal pipe culvert in the Herbert Hoover Dike. This structure is located at the north end of the L-8 canal through the Herbert Hoover Dike at the connection of the L-8 borrow canal to Lake Okeechobee. C-10A is operated and maintained by the USACE.

Primary Function - The primary purpose of this structure is to supply water for irrigation from the lake to the L-8 basin, and to a lesser extent to eastern Palm Beach County (via S-5AE and C-51). In doing so the structure provides irrigation releases from Lake Okeechobee to the agricultural lands along the L-8 canal and affords gravity drainage of that canal into Lake Okeechobee during flood periods, when the Lake is lower than the canal. Regulatory releases via the L-8 are rare since the Miami, West Palm Beach, North New River, and Hillsboro canals are more often used for releases.

Secondary Function – The structure also affords some measure of water supply to the East Coast area of Palm Beach County.

Note - Four of the five culverts of this structure have flap gates on the lakeside. If these gates are closed, they open “automatically”, when the canal stage is above the lake stage, to discharge

water from the basin to the lake by gravity flow. The fifth (center) culvert has a slide gate, also on the lakeside. Culvert 10A was used occasionally to transfer water, discharged from WCA-1 to the L-8 borrow canal, to Lake Okeechobee. Culvert C-13 is located approximately one mile south of C-10A.

S-76

Description - This structure is a reinforced concrete, gated spillway with discharge controlled by three stem-operated, vertical lift gates. The structure is located on the L-8 borrow canal, about two miles east of Lake Okeechobee.

Primary Function - The structure prevents runoff from the area east of Levee 8 from overtopping levees in the developed area between the structure and Lake Okeechobee.

Secondary Function – The structure also makes discharges from the lake during dry periods, via USACE-operated culvert C-10A through Herbert Hoover Dike.

Note – This structure is manually operated under either flood or normal conditions. Discharges are manually controlled to provide releases to meet agricultural requirements as water is available. During normal conditions gates are full open. During flood conditions the gates remain open until the water approaches damage stage west of the structures.

S-5A

Description – This structure is a six-unit pump station located on the south side of U.S. Highway 441 and Canal 51 (West Palm Beach Canal) between the canal and the borrow canals of Levees 7 and 40 about 20 miles west of West Palm Beach. The structure consists of a reinforced concrete structure with concrete superstructure. Other station equipment includes a station service system to provide water for wash down, a dewatering system to facilitate pump servicing or inspection, and a filtered water system to furnish water for engine jacket water make-up and domestic purposes.

Primary Function – The primary purpose of the pumping station is to pump surplus water from the L-10, L-12 basin, the S-5A agricultural area northwesterly of the pumping station into WCA-1, at the rate of .75 inch per day, from the 230 square mile tributary drainage area.

Note, Post ECP - This pump station discharges to the STA-1 Inflow and Distribution Works for treatment in STA-1W or in the future STA-1E.

Secondary Function – The station has two additional functions, when these will not interfere with its primary purpose. First, the station is employed to remove excess flows from the L-8 and C-51 basins. Finally, it is employed to remove excess water from Lake Okeechobee when it is above its regulation schedule.

Note – The operation of the station to accomplish its primary purpose is a complex function of many variables. Each of these will be discussed separately but, of course, in practice they are

considered as a group. Surplus water enters the L-10, L-12 basin primarily by pumped discharge, and secondarily by gravity discharge from adjacent lands. The total installed capacity of the pumps discharging into the system exceeds the capacity of S-5A. This fact is a major impact of the station operation, especially if a major storm appears imminent. Water levels in adjacent basins are sometimes of importance to the operation of the S-5A pumping station. When inflows from these basins will not jeopardize flood control in the L-10, L-12 basin, the appropriate gates are opened and S-5A is placed in operation. The pumps in this station are designed to pump drainage water containing a negligible amount of sediment or other material, which might damage the surfaces of the pump or the bearings. Structure G-302 is located close to Structure 5A.

S-5AE

Description – This structure is a double-barreled reinforced concrete box culvert, located on Canal 51 (West Palm Beach Canal) at the point where Levee 8 crosses that canal. Control is affected by motor operated sluice gates mounted in a reinforced concrete well structure.

Primary Function – This structure functions with S-5AW, S-5AS and S-5A to control irrigation releases in the area served by C-51 (the West Palm Beach Canal).

Secondary Function – This structure is also used to discharge flood runoff from L-8 via C-51 to tidewater and from C-51 into WCA-1 by pumping at S-5A.

Note – The gates shall be closed whenever a downstream flood condition is imminent in C-51. The gates may be opened to release excess water to the east whenever the previously described downstream flood conditions do not exist and when a flood potential exists upstream in the Levee 8 area, that is, whenever the stage in L-8 at Sand Cut exceeds 17.0. The gates may also be opened to release excess water to the west from C-51 whenever S-5A's ability to remove excess water from the L-10, L-12 basin is not jeopardized.

S-5AS

Description – This structure is a reinforced concrete, gated spillway with discharge controlled by two cable-operated, vertical lift gates. The structure is located on L-40 borrow canal, at the point where L-7 crosses that canal, on the northern perimeter of WCA-1.

Primary Function – This structure functions with S-5AE, S-5AW, and S-5A to control flood runoff from the L-8 area.

Secondary Function – This structure is also used to make irrigation releases from WCA-1 to the L-10, L-12, and the L-8 and C-51 basins.

Note – This structure is operated under either flood or agricultural water supply conditions. During flood conditions the gates are opened to pass flood flows into WCA-1 when the headwater (L-8) stage exceeds the tailwater (WCA) stage, a very rare condition. During water

supply conditions the gates may be used to discharge flows from WCA-1 when stages in canals in the C-51, L-10, L-12 or L-8 basins are low.

S-5AW

Description – This structure is a double-barreled reinforced concrete box culvert, located on Canal 51 (West Palm Beach Canal) at the point where Levee 8 meets that canal. Control is affected by motor operated sluice gates mounted in a reinforced concrete well structure.

Primary Function – This structure functions with S-5AE, S-5AS, and S-5A to control irrigation releases in the L-10, L-12 basin.

Secondary Function – The structure is also used to pass flood runoff from L-8 and C-51 into WCA-1 via Pumping Plant S-5A.

Note – The criteria that govern the operation of this structure are a function of either the flood or dry conditions, which are described in the following sentences. The gates of this structure shall always be closed when a flood condition exists in the L-10, L-12 basin. The use of the gate is also determined by other factors, such as environmental concerns, and water level in WCA-1. During low-water conditions, when flood conditions are not imminent, the gates will be operated subject to water availability to meet water use requirements in L-10 and L-12 basins and in the L-8 Basin.

G-250

Description - This structure was a six unit pumping station located at the northeast corner of the former Everglades Nutrient Removal Project (ENR). Upon completion of STA-1W, the inflow pumps were removed from service. The seepage pumps remain in service.

Primary Function - The station pumped water from the L-10, L-12 basin into the former ENR Project. The pump was operated when water was required to be pumped into the former ENR Project. The pump was operated remotely or locally.

Note -The station was completed in 1993. Operation of the station began in August 1994. Three of the six pumps were removed in August 1998, due to the construction of STA-1W. This structure was revised in STA-1W construction (1997 - 2000).

G-250S

Description – This structure is a three-unit pumping station located adjacent to inflow structure G-303; G-250S has a maximum total capacity of 201 cfs. (However, hydraulic constraints in the north seepage canal limit the estimated maximum conveyance to approximately 120 cfs.) G-250S is equipped with three 36-inch diameter pumps driven by electric motors.

Primary Function - This station controls the water stages in the STA-1W seepage canal north of Treatment Cells 5A and 5B.

Note: G-250S was used to redirect limited volumes of Cell 5 discharges through structure G-327 A into Treatment Cells 1,2,3, and 4 during the Start-up phase.

G-251

Description - This structure is a six-unit pumping station located at the southeast corner of the former ENR Project. Each pumping unit is has a rated capacity of 75 cfs (33,660 gpm).

Primary Function - The station is used to pump water from STA-1W into WCA-1. The pump can be operated remotely and locally.

Note - The station was completed in 1993. Operation of the station began in August 1994.

Post ECP - Runoff from S-5A Basin is pumped to the STA-1 Inflow and Distribution Works which discharge through the gated spillway G-302 to STA-1W. Pump Station G-310 discharges from STA-1W to WCA-1. When STA-1E is complete, STA-1 Inflow and Distribution Works will also discharge through gated spillway G-311 to STA-1E. Under water supply or certain flood conditions S-5A runoff can be sent to WCA-1 via G-300 and G-301.

G-310

Description – The G-310 pump station began operations in October 2000. The station houses two 10-cylinder, opposed piston, 2-cycle diesel engines, two 6-cylinder, opposed piston, 2-

cycle diesel engines and two electric motors at 200 horsepower each. The 10-cylinder engines are capable of pumping 950 cubic feet of water per second (CFS); the 6-cylinder engines pump 470 cubic feet of water per second (cfs) and the electric motors pump 100 cubic feet of water per second.

Primary Function – Runoff from S-5A Basin is pumped to the STA 1 Inflow and Distribution Works which discharge through the gated spillway G-302 to STA-1W. The function of G-310 and G-251 is to discharge from STA-1W to WCA 1.

Note – This is a Post ECP Structure. See Post ECP noted under G-251 above.

L-7 Canal

Description – Exterior Borrow canal located along the eastern boundary of surface water management basin S-6 and the southeastern boundary of surface water management basin S-5A.

Primary Function - This canal distributes water within WCA-1, Loxahatchee Wildlife Refuge.

L-8 Canal

Description – The L-8 borrow canal connects Lake Okeechobee with WCA-1. The connection to Lake Okeechobee is by way of C-10A at the north end of the borrow canal, four miles south of

Port Mayaca. The connection is by way of S-5A and S-5AS at the south end of the borrow canal at the northern most tip of the WCA-1. Near the south end of the borrow canal, it intersects the L-10/L-12 borrow canal. The intersection of the L-8 borrow canal with the L-10/L-12 borrow canal is about two miles east of the intersection of U.S. Highway 441 and U.S. Highway 98. The connection of the L-8 borrow canal to WCA-1 is immediately south of the intersection.

Primary Function – The purpose of L-8 is to protect the developed agricultural area around the southeastern shore of Lake Okeechobee from overflow by flood waters originating in the wide flat area located to the north and east of the levee alignment.

Secondary Function – The borrow canal also supplies water for irrigation and control of ground water elevations.

Note – This canal is also used to supply water from the L-8 basin, WCA-1, or Lake Okeechobee to the City of West Palm Beach water supply system and to accept discharges of excess water from the West Palm Beach water supply system. S-5A and C-51 must remove excess water from their respective basins before removing water from L-8 basin.

Table H.6.2.5: Perimeter Structures – West Palm Beach and L-8 Canal

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)	
C-10	2 ~ 120" CMP w/flap gate on lake side Inv. EL = 5.5 Length = 110 ft	Downstream of East Beach WCD				
C-10A	CMP culvert w/ 4 flap gates (lakeside control) 1 sluice gate(center barrel)	19.0 (landside) flood discharge	15.6 (lake side) flood discharge		1000 (flood discharge)	
S-76	Gated spillway 3 gates 7.5' x 12.0'	20.3 (flood discharge)	19.6 (flood discharge)		1000 (flood discharge)	
S-352	Gated spillway 2 gates 23ft wide x 6.3ft high. Net Crest length = 46 ft Crest elev = 5.2ft NGVD	Water Supply 10.5 Regulatory Releases 24.8 (lake side)	Water Supply 10.0 Regulatory Releases 13.5 (canal side)	Not used to control stage	Water Supply 900 Regulatory Releases 1250	
C-13	Culvert Downstream of Pelican Lake WCD stand by pump station				100 CFS	
S-5AW	Gated Box Culvert 2-7ft x 7ft x 80ft Reinforced Concrete Box Flow line Elev. = -1.75ft to 0.3ft NGVD	13.0 (west side) flood discharge	11.5 (east side) flood discharge	Not used to control stage	700	

Structure	Type	Design HW Stage (ft NGVD)	Design TW Stage (ft NGVD)	Optimum Stage (ft NGVD)	Design Discharge (cfs)
S-5A	Pump Station 6 Units - 800 cfs each	13.0 11.5 (irrigation) 10.5 (drainage)	24.1	11.5-12.0 in L-10/L-12 Borrow Canal	4800
G-302	Gated Spillway	--	15.8	--	3250
G-251	Pump Station 6 units – 75 cfs each	11.5	14.0-17.5	--	450
G-310	Pump Station	7.0-13.5 7.0(low headwater)	14.0-17.5		6 pumps 3,040 cfs total

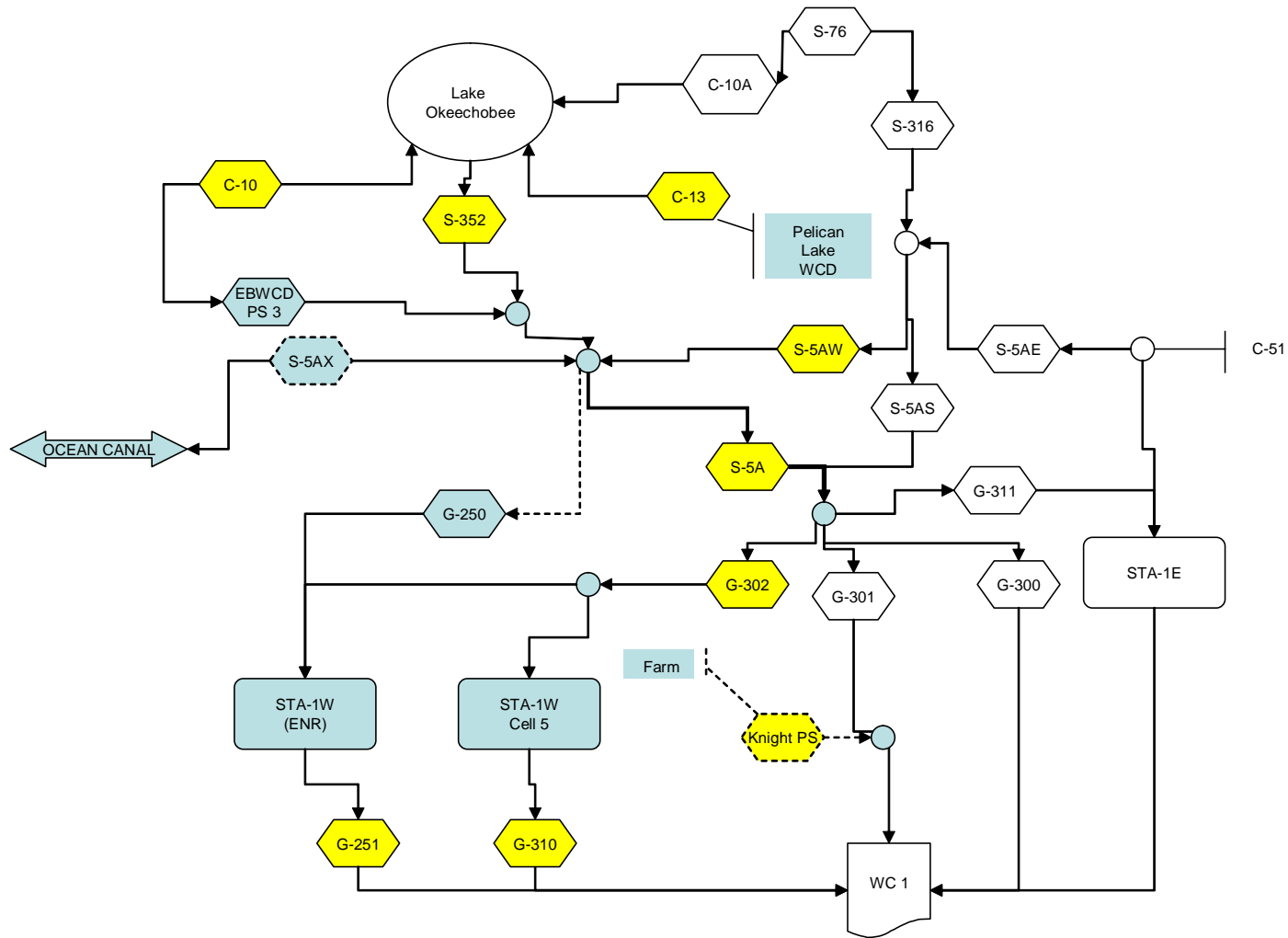


Figure H.6.2.6– West Palm Beach and L-8 Canals – Flow Diagram

