Everglades Agricultural Area Regional Feasibility Study

Deliverable 1.1.2 – Evaluation of 2006 Hydrologic Simulation Results (Final Report)

(Contract No. CN040912-WO04 Phase 2)

Prepared for:

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South Florida Water Management District
EAA Regional Feasibility Study
ADA Contract No. CN040912-WO04 Phase 2
Evaluation of 2006 Hydrologic Simulation Results
B&McD Project No. 38318

Dear Mr. Vazquez:

Burns & McDonnell is pleased to submit this Final report on our "Evaluation of 2006 Hydrologic Simulation Results". This document constitutes Deliverable 1.1.2 under ADA Engineering, Inc. Task Order No. BM-05WO04-02 dated April 27, 2005.

We gratefully acknowledge the valuable contributions of both your staff and that of the South Florida Water Management District in the development of the information presented herein.

Certification

I hereby certify, as a professional engineer in the State of Florida, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse without specific verification or adaptation by the Engineer. This certification is provided in accordance with the provisions of the Laws and Rules of the Florida Board of Professional Engineers under Chapter 61G15-29, Florida Administrative Code.

Galen E. Miller, P.E., Florida P.E. #40624
Date:_____

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1. INTRODUCTION

This document and the analyses it summarizes were prepared by Burns & McDonnell Engineering Co., Inc. under contract to ADA Engineering, Inc (ADA). The conduct of these analyses and preparation of this document were authorized by the South Florida Water Management District (SFWMD or District) through its March 27, 2005 issuance of Work Order No. CN040912-WO04 to ADA, and subsequently authorized by ADA through its April 27, 2005 issuance of Task Order BM-05WO04-02 to Burns & McDonnell.

1.1. Background

Under the Everglades Construction Project (ECP), the South Florida Water Management District has constructed several STAs and the U.S. Army Corps of Engineers constructed STA-1E to help improve the quality of waters released to the Everglades Protection Area (EPA). In addition to the existing STAs, the District is planning certain STA expansions and enhancements, Everglades Agricultural Area (EAA) canal improvements, construction of the EAA Storage Reservoir Project, and other EAA improvements. With recognition of these planned improvements, the EAA Regional Feasibility Study (RFS) will evaluate alternatives for redistributing inflow volumes and phosphorus loads to the various STAs to optimize phosphorus removal performance. This study is not intended to define the final arrangement, location or character of these proposed projects but is a fact-finding exercise to develop the information necessary for the subsequent planning, design and construction of these future projects.

1.2. Scope of Work

This document is one of a series of deliverables to be prepared under Task 1 "Develop Baseline Data" of the SFWMD Work Order No. CN040912-WO04. The overall objective of Task 1 is the development of revised baseline data for use in the EAA RFS consistent to the extent practicable with recent actual data and capable of acceptance by other agencies and parties (such as the United States Department of the Interior and the EAA Environmental Protection District) as being representative of inflow volumes and total phosphorus loads to the various stormwater treatment areas. Basins considered in this Task include the following:

- C-51 West Canal
- S-5A (West Palm Beach Canal)
- Ch. 298 Districts:
    - East Beach Water Control District
    - East Shore Water Control District
    - 715 Farms (State Lease No. 3420)
    - South Shore Drainage District
    - South Florida Conservancy District, Unit 5 (S-236 Basin)
- S2/S-6/S-7 (Hillsboro and North New River Canals)
- S-3/S-8 (Miami Canal)
- C-139 and C-139 Annex
- L-8 Canal
- Lake Okeechobee deliveries south to the STAs and Everglades

The following subtasks were established in Work Order No. CN040912-WO04 as elements of the work necessary to achieve the overall objective of Task 1:

Task 1.1 - Evaluation of the 2006 hydrologic simulation results for reasonableness, particularly as compared to recent (WY 1995-2004) actual data adjusted for significant changes in regional hydrology and water management operations over that period.

Task 1.2 - Evaluation of the 2010 and 2015 hydrologic simulation results for reasonableness, related primarily to changes from the 2006 simulation resulting from implementation of incremental significant changes to basin hydrography and regional water management operations.

Task 1.3 - Development of inflow volumes and total phosphorus concentrations and loads segregated by source over WY 1995-2004, based on the District-furnished historic data. The intent of this activity is to develop relationships between discharge and total phosphorus concentration by source that can be subsequently applied to the 1965-2000 STA inflow simulation results.

Task 1.4 - Definition of a methodology for applying the relationships developed above to the simulated inflow data sets structured for use in DMSTA analyses of the treatment areas.

Task 1.5 - On the basis of the methodology defined under Task 1.4, development of inflow data sets for all six (6) STAs for each of the three (3) hydrologic simulations (2006, 2010, and 2015).

This document was prepared under Task 1.1 "Evaluate 2006 Hydrologic Simulation Results", and presents a detailed comparison of the results of the 2006 SFWMM simulation to those considered in the October 2003 *Everglades Protection Area Tributary Basins, Long-Term Plan for Achieving Water Quality Goals* (the Long-Term Plan), and a March 2005 Draft *Supplemental Analysis* prepared for the Everglades Agricultural Area Environmental Protection District by Burns & McDonnell (the Supplemental Analysis). Volumes are compared by source both for average annual results, and for overlapping periods by Water Year (e.g., Water Years 1995-2000). This comparison is intended to identify any significant differences, and propose adjustments to the simulation data necessary to more closely parallel recent actual conditions, when appropriate. In the performance of this Task, due consideration has been given to defined changes from historic operations in system management.

1.3. SFWMM Simulation

Simulated flows considered herein were developed by the SFWMD employing v5.0 of the South Florida Water Management Model (SFWMM), with certain assumptions made specifically for the purposes of this analysis. The simulation results are in the form of mean daily discharge estimates over a 36-year period extending from January 1, 1965, through December 31, 2000. For all analyses presented herein, the simulation results are summarized by Water Year (as used herein, a Water Year begins on May 1 of any given year; Water Year 1966 ends April 30, 1966), resulting in 35 Water Years of data summary. The Water Year was selected for use in this analysis to permit direct comparison to previous estimates and to the SFWMD's convention employed in the various basin rules (such as 40E63 of the Florida Administrative Code, or F.A.C.).

1.3.1. Principal Assumptions for ECP 2006 Simulation

No comprehensive documentation was furnished by the District defining the principal assumptions embodied in the 2006 ECP simulation. Based on such information as was furnished by the District or is evident in review of the simulation results, the following principal assumptions appear to have been made for the simulation:

- Lake Okeechobee regulatory releases are sent to STA-3/4 only;
- All of the stormwater treatment areas of the 1994 ECP are complete. As modeled, the following additional STA expansions are considered complete: initial expansion of STA-2 to include new Cell 4; the initial expansion of STA-5 to include the third flow-way; and STA-6 Section 2;
- Existing discharges from Acme Improvement District Basin B to the Loxahatchee National Wildlife Refuge (LNWR) have been redirected through Acme Basin A to the C-51 West Canal and STA-1E;
- The Interim Action Plan for Lake Okeechobee (under which backpumping to the Lake at S-2 and S-3 is to be minimized) is continued in the simulation;
- The simulation considers no reduction in EAA runoff associated with the implementation of Best Management Practices (BMPs); previous simulations had assumed a reduction of up to 20%;
- Lake Okeechobee is assumed to be operated under the Water Supply for Environment (WSE) regulation schedule;
- Lake Okeechobee water supply deliveries to the Lower East Coast (LEC) bypass the STAs when the receiving Water Conservation Areas (WCAs) are below a defined elevation (discharges assumed to remain in the canals and not exit to the adjacent marshes). As reflected in the simulation, those elevations are 14.0 ft. NGVD in WCA-1 (the LNWR); 10.5 ft. NGVD in WCA-2A; and 7.5 ft. NGVD in WCA-3A. The District has proposed an increase of 0.5 feet in each of those "floor" elevations to the Technical Oversight Committee (TOC) structured under the federal/state Settlement Agreement. Although those increases have not yet been approved by the TOC, the Florida Department of Environmental Protection (FDEP) has incorporated those new levels in the STA-1E operating permit. For

the purpose of the RFS, use of the lower elevations may be considered conservative and will be continued;

- The simulation considers Year 2000 population, land use, irrigation demands, and public water supply demands;
- That part of the S-5A Basin west of Structure G-341 in the Ocean Canal is considered to have been diverted to STA-2;
- Chapter 298 District runoff and discharges diverted from Lake Okeechobee are redirected to the STAs as follows:
  - Discharges diverted from the East Beach Water Control District (EBWCD) are considered directed to STA-1W (the extent to which some part of these discharges may be delivered to STA-1E requires further analysis);
  - Discharges diverted from the East Shore Water Control District (ESWCD) and 715 Farms are considered directed to STA-2;
  - Discharges diverted from the South Shore Drainage District (SSDD) and S-236 Basin are considered directed to STA-3/4.
- Flood control releases from the C-51 West Canal are made through S-319 to STA-1E when the canal stage exceeds 12.0 ft. NGVD during the dry season or 11.5 ft. NGVD during the wet season; releases are terminated when the canal stage drops below 11.5 ft. NGVD during the dry season and 11.0 ft. NGVD during the wet season;
  - All inflows to the C-51 West Canal are included in S-319 discharges unless the total inflow exceeds the 3,860-cfs capacity of S-319, at which time S-155A is opened to release the excess flow to the C-51 Canal east of S-155A;
  - Water supply inflows to the LEC at the west end of the C-51 West Canal are considered to pass directly through to the C-51 East Canal.
- Runoff from the Indian Trails Water Control District is not directed to either STA-1E or STA-1W (determination of the extent to which the simulation is consistent with that stated assumption requires further analysis);

- The basic prioritization for runoff and releases through the EAA canals is in the following order;
  - EAA basin runoff;
  - Discharges diverted from the 298 districts;
  - Lake Okeechobee environmental and water supply releases;
  - Lake Okeechobee regulatory releases.

In addition to the above assumptions, staff of SFWMD's Office of Modeling (OoM) confirmed the following in a coordination meeting held on April 28, 2005:

- The model does not consider groundwater or seepage interaction between Lake Okeechobee and the adjacent EAA basins or Chapter 298 districts;
- To date, no attempt has been made to calibrate the SFWMM model to historic discharges from the 298 districts;
- Runoff from neither the C-139 Basin nor the C-139 Annex is directly simulated in the SFWMM;
- To date, no attempt has been made to calibrate the distribution of S-2/S-6/S-7 Basin runoff between the Hillsboro and North New River canals to historic data;
- The SFWMM does not expressly consider either the presence or conveyance capacity of the Ocean, Cross, or Bolles canals.

1.3.2. SFWMM v5.0 Structure Definition Glossary

The following is a listing of the structure and flow definitions taken from the overall Glossary for v5.0 of the South Florida Water Management Model (SFWMM). This listing is limited to those terms of potential interest in this analysis, and generally excludes terms associated with basins and canals beyond the limits of the Everglades Agricultural Area, the C-51 West Basin, the L-8 Basin, the C-139 Basin, the C-139 Annex, and the Loxahatchee National Wildlife Refuge. In addition, structures and flow definitions for outflows from the various stormwater treatment areas of the ECP are excluded from this listing. The full Glossary may be found at

http://www.evergladesplan.org/cerpzone

Access to the above site is presently restricted to Comprehensive Everglades Restoration Plan (CERP) Project Development Team (PDT) members, RECOVER and other programmatic entities directly involved in CERP implementation. In the following listing, comments or additions made by Burns & McDonnell are shown in *italicized text.*

298ST1 = portion of "298" Districts runoff diverted to STA-1W *(replaced in 2006 ECP simulation with EBDST1, see end of this glossary)*

298ST2 = portion of "298" Districts runoff diverted to STA-2 *(replaced in 2006 ECP simulation with ESDST2 and 715ST2 , see end of this glossary)*

298ST3 = portion of "298" Districts runoff diverted to STA-3 *(replaced in 2006 ECP simulation with SSDST3, see end of this glossary)*

351RG = Lake Okeechobee regulatory discharge via S351

351WS = glades env releases + lec water supply met by Lake Okeechobee via S351

352RG = Lake Okeechobee regulatory discharge via S352 *(=0 in the 2006 ECP simulation)*

352TLK = Volume of WPB basin runoff in EAA routed to Lake Okeechobee via S352 for water supply purposes *(=0 in the 2006 ECP simulation)*

352WS = glades env releases + lec water supply met by Lake Okeechobee via S352

354RG = Lake Okeechobee regulatory discharge via S354

354WS = glades env releases + lec water supply met by Lake Okeechobee via S354

ACME2 = Water supply intake pump from the LNWR to ACME Basin B. Represents intake capability at ACME2 pump station.

ACME3 = Flood control gravity discharge from ACME Basin A to C-51 canal. Represents gravity discharge capability at ACME3 pump.

ACME4W = Flood control pump discharging from ACME Basin A to C-51 canal. Represents ACME4 pump station.

ACME6 = Flood control pump discharging from ACME Basin A to C-51 canal (west of S-155A). Represents ACME6 pump station.

ACMEBA = Water supply gravity discharge from ACME Basin B to ACME Basin A. Represents culverts under Pierson Road.

ACMECU = Flood control gravity discharge from ACME Basin A to ACME Basin B. Represents culverts under Pierson Road. *(Assumed to actually represent gravity discharge from ACME Basin B to ACME Basin A, and then to C-51 West Canal)*

ACMERF = ACME District runoff into WCA-1 *(=0 in the 2006 ECP simulation)*

ADDSLW = additional water supply release to LWDD from WCA-1 thru S-5AS and S5AE

AGQ = *Net* discharge from Lake Okeechobee to 298 districts

AGQRF = 298 District runoff into Lake Okeechobee

AGQWS = 298 District water supply from Lake Okeechobee

AM4WS1 = Water supply intake pump from C-51 to ACME Basin A. Represents intake capability at ACME3 pump station.

AM4WS2 = Water supply intake pump from C-51 to ACME Basin A. Represents intake capability at ACME4 pump station *(=0 in the 2006 ECP simulation)*

BFLTL8 = Backflow to Lake Okeechobee via L-8 for water supply purposes *(=0 in 2006 ECP simulation)*

BKMCL8 = Backflow from M-Canal to L-8 if M-Canal is sufficiently high *(=0 in 2006 ECP simulation)*

BPRC51 = outflow from proposed L8 reservoir (up to 300 cfs) to C-51 (Alt. D only) *(=0 in 2006 ECP simulation)*

BPRL8S = outflow from proposed L-8 reservoir for water supply purposes to southern L-8 canal; (Alt. D only) *(=0 in 2006 ECP simulation)*

C10ABK = backflow from L-8 canal to Lake Okeechobee

C51LGQ = Water supply to Loxahatchee groves WCD from C51

CL8R1 = outflow from L-8 restoration area into L-8 canal *(=0 in 2006 ECP simulation)*

CL8R2 = outflow from L-8 restoration area into L-8 canal *(=0 in 2006 ECP simulation)*

CORBT1 = outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal (first outlet)

CORBT2 = outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal (second outlet)

DIVERS = diversion of runoff from WPB canal basin in EAA into Hillsboro canal and STA-2 (part of ECP)

DPRESO = outflow for flood control purposes from Dupuis Reserve into the L-8 canal

FLIMPH = Import Glades water met by Lake Okeechobee via HLSB canal thru S351 *(=0 in 2006 ECP simulation)*

FLIMPM = Import Glades water met by Lake Okeechobee via Miami canal thru S354

FLIMPN = Import Glades water met by Lake Okeechobee via NNR canal thru S351 *(=0 in 2006 ECP simulation)*

FLIMPW = Import Glades water met by Lake Okeechobee via WPB canal thru S352 *(=0 in 2006 ECP simulation)*

FLWIMP = FLIMPH + FLIMPM + FLIMPN + FLIMPW

G136EA = flow from outside model boundary to EAA_MIAMI basin *(completely separate term from G136SO)*

G136SO = Portion of G136 flow routed South to STA3&4

G1553A = G155 flow from WCA-3A (occurs when G155 flow is negative) *(=0 in 2006 ECP simulation)*

G261 = outflow from L-8 restoration area into L-8 canal *(=0 in 2006 ECP simulation)*

G262 = outflow from L-8 restoration area into L-8 canal *(=0 in 2006 ECP simulation)*

G263 = outflow from L-8 restoration area into L-8 canal *(=0 in 2006 ECP simulation)*

G311 = outflow from STA-1E when stages in STA-1E get sufficiently high to either STA-1W or WCA-1 depending on conditions

G94AB = Culverts on the L-40 borrow canal discharging into Lake Worth Drainage District canal for water supply.

G94C = Culvert on the L-40 borrow canal discharging into Lake Worth Drainage District canal for water supply.

HLSBRG = Lake Okeechobee regulatory discharge via Hillsboro canal *(=0 in the 2006 ECP simulation)*

HLYQIN = inflow into Holeyland from EAA-Miami basin runoff

ITLBO = outflow from lower basin in Indian Trail Water Control District to C-51 Canal

ITUBO = outflow from upper basin in Indian Trail Water Control District to lower basin

L101OT = outflow from L101 Inflow & Distribution Works Basin between STA1E & STA1W

L8C51W = flood control discharges from L-8 into C-51W, i.e. C-51 west of G-124 or proposed S155A

L8CP = discharge from Lake Okeechobee to maintain L-8 canal

L8RNF = total outflow from L-8 canal for flood control

L8TBPR = volume of excess water from southern L8 to proposed L8 reservoir; (Alt. D only) *(=0 in 2006 ECP simulation)*

L8TCA1 = flood control discharges from L-8 to WCA-1 via S-5AS *(=0 in 2006 ECP simulation)*

LGROVQ = outflow from Loxahatchee Groves Water Control District to C51

LKTROT = water supply from Lake Okeechobee via STA-5 to maintain appropriate schedule in Rotenberger Tract *(=0 in 2006 ECP simulation)*

LKTSEM = water supply from Lake Okeechobee to meet supplemental BCR Seminole demands

M1Q = flow from M-1 Canal to C-51 Canal

MIAST3 = Runoff from Miami Basin, 298 District, S236 Basin, and G136 to STA3&4 through Miami Canal and G372

NNRCRG = Lake Okeechobee regulatory discharge via North New River canal

NNRST3 = NNRC Basin runoff routed to STA3&4 through North New River Canal and G370

Q1WDN = flow from WELDN canal to C51 *West*

RESL8O = emergency overflow from Indian Trails reservoir to L-8 canal *(=0 in 2006 ECP simulation)*

RESTL8 = flood control releases from reservoir in Indian Trails Water Control District into L-8 canal

RFTST2 = flow to STA-2 from Hillsboro basin and 298 District runoff *(715ST2 and ESDST2) plus flow diverted from S-5A Basin (DIVERS)*

RFWPBB = runoff from WPB canal basin in EAA *(includesEBDST1)*

S10 = total outflow from L40 borrow canal in WCA-1 to nodes (29, 44), (30,43) and (32,42) in WCA-2A

S10E = flow from L40 borrow canal in WCA-1 to node (28, 46) in WCA-2A thru S-10E *(=0 in 2006 ECP simulation)*

S10EEV = flow for environmental water supply purposes from WCA-1 to WCA-2A thru S-10E *(=0 in 2006 ECP simulation)*

S10ENV = flow for environmental water supply purposes from WCA-1 to WCA-2A through S-10A, C and D *(=0 in 2006 ECP simulation)*

S10ERG = flood control discharges thru S-10E from WCA-1 to WCA-2A node (28, 46) *(=0 in 2006 ECP simulation)*

S10EWS = flow for water supply purposes to LEC Service Area (=0) through S-10E *(=0 in 2006 ECP simulation)*

S10REG = flood control (regulatory) discharges thru S-10's from WCA-1 into WCA-2A

S10WS = flow for water supply purposes to LEC Service Area (=0) through S-10A, C and D *(=0 in 2006 ECP simulation)*

S1324P = S-361 pump discharging from sections 13 & 24 (R40E, T44S) to STA-1E for flood control

S1324W = Weir discharging from sections 13 & 24 (R40E, T44S) to C-51 canal (west of S-155A)

S150 = discharge from EAA_NNR/HLSB basin to conveyance canal in WCA-3A (CA3 canal) *(subset of 351WS, not basin runoff – limited to Lake water supply release to LEC bypassing STA-3/4 to S-150)*

S155A = flow from C-51W canal to C-51 canal)

S2 = total discharge from Lake Okeechobee to EAA_NNR/HLSB basin

S236RO = runoff from S-236 basin backpumped thru S-236 into Lake Okeechobee

S236SO = portion of runoff from S-236 basin routed south to appropriate STA's

S236WS = water supply delivery from Lake Okeechobee via S-236 to meet agricultural needs in S-236 basin

S2PMP = backpumping of runoff from EAA_NNR/HLSB basin to Lake Okeechobee via S2

S2TMCL = flow from L-8 to M-Canal via pump

S3 = total discharge from Lake Okeechobee to EAA_MIAMI basin

S319 = flow from western C-51 basin into STA-1E via S-319

S319WS = water supply to C-51 from STA-1E via S-319 *(=0 in the 2006 ECP simulation)*

S351 = total flow from Lake Okeechobee into EAA_NNRC/HLSB basin via S-351

S351PK = flow from Lake Okeechobee through S351 to help meet ENP flow targets

S352 = total flow from Lake Okeechobee into EAA_WPB basin via S-352

S352L8 = discharge from Lake Okeechobee via S352 into L-8 canal

S354 = total flow from Lake Okeechobee into EAA_MIAMI basin via S-354

S354PK = flow from Lake Okeechobee through S354 to help meet ENP flow targets

S39 = *Total* flow from L-40 canal in WCA-1 to Hillsboro canal

S39RG = WCA-1 regulatory discharge to Hillsboro canal via S-39

S39WS = water supply discharges from WCA-1 to Hillsboro canal via S-39

S3PMP = flow backpumped for flood control to Lake Okeechobee from EAA_Miami basin

S5A1 = discharge from EAA_WPB basin to WCA-1 or STA-1W and STA-1Ethrough S-5A pumps

S5A2 = net flow from WPCB canal to CA1 canal thru S5AS

S5A2NO = water supply discharges from WCA-1 via S-5AS through WPCB (S5A complex) canal into L8/C-51/LWDD

S5A2SO = total flow to WCA-1 via S-5AS

S5A3 = net flow from L-8 canal to WPCB canal

S5A3NO = water supply releases from WCA-1 to L-8 canal *(= sum of S352L8 and WSL8S)*

S5A3SO = outflow from L-8 canal *(with the exception of a 119 acre-feet differential in Water Year 1968, this term is identical to L8C51W)*

S5A4 = flow from WPCB canal to C51W canal via S5AE

S5A4E = portion of flow through S5AE going eastward into C-51

S5A4W = westward flow from C-51W canal (only for emergency flood control measures) *(=0 in 2006 ECP simulation)*

S5AWC1 = water supply from Lake Okeechobee that bypasses STA-1W to meet Lower East Coast demands

S6 = discharge from EAA_NNR/HLSB basin to WCA-1 (current operation) or to STA-2 (proposed operations)

S6LCWS = water supply from Lake Okeechobee and EAA runoff to LEC that by-passes STA-2

S6NBYP = EAA runoff in excess of capacity of S6 into STA-2; potential (not actual) for bypass into WCA-2A

S7 = discharge from EAA_NNR/HLSB basin to L-38 canal in WCA-2A

S7BPMR = emergency bypass of untreated EAA runoff around STA3/4 through S7 into WCA-2A

S7GRAV = gravity flow thru S-7 spillway into WCA-2A

S7NBYP = EAA runoff in excess of design for G370 into STA3&4; potential (not actual) for bypass through S-7

S7PUMP = pumped flow thru S-7 pump

S8 = discharge from EAA_MIAMI basin to L-23E canal in northwestern WCA-3A

S8BPMR = emergency bypass of untreated EAA runoff around STA3/4 through S8 into WCA-3A

S8GRAV = gravity flow thru S-8 spillway into WCA-3A

S8NBYP = EAA runoff in excess of design for G372 into STA3&4; potential (not actual) for bypass through S-8

S8PUMP = pumped flow thru S-8 pump

SITWCD = flow for flood control purposes from upper basin of Indian Trails Water Control District (WCD) to Indian Trails WCD reservoir

ST1EI1 = inflow into STA-1E via L-101 (up to 1,200 cfs runoff from EAA_WPB basin)

ST1WI1 = inflow into STA-1W

ST2BYP = volume of EAA runoff that bypasses STA-2 untreated into WCA-2A *(=0 in the 2006 ECP simulation)*

ST2REX = volume of excess water from Hillsboro canal basin plus the diversion from WPB canal basin above the inflow capacity into STA-2 (volume of excess water - inlet capacity)

ST3BYP = volume of EAA runoff that bypasses STA-3&4 untreated into WCAs *(=sum of S7BPMR and S8BPMR)*

ST3QIN = inflow into STA3 and STA4

ST3REX = volume of excess water from Miami & NNRC canal basins in the EAA greater than the total inflow capacity into STA-3&4 (in cfs-day), i.e., volume of excess water - inflow capacity

ST5REX = inflow from western basins in excess of inlet structure capacity into STA-5

ST6REX = volume of potential inflow from appropriate basins greater than the inflow capacity for STA-6

STA5IQ = inflow into STA5 from runoff from Hendry county (G-88,G-89 & G-155) *(structures at which runoff from C-139 Basin to L-3 Canal was historically measured – monitoring at those structures was replaced by L3DF in January 1996 and by G-406 and G-342 structures when STA-5 was completed)*

STA6IQ = inflow into STA6 from USSGR Plantation

SUGDMD = demand in ~11,000-acre Sugar Ranch in the EAA (>0 if Sugar Ranch is handled separately, as in the future base case) *(=0 in 2006 ECP simulation)*

SUGREX = runoff from unit 2 (Sugar Ranch) in excess of inflow capacity of STA-6 *(=0 in 2006 ECP simulation)*

SUGRF = runoff from ~11,000-acre Sugar Ranch in the EAA (>0 if Sugar Ranch is handled separately, as in the future base case)

U1TL28 = Excess water from Unit 1 of USSG routed to L-28 canal that is eventually pumped into WCA-3A via S140A or sent into STA6 when Full ECP is in place.

WL1351 = water supply from Lake Okeechobee to LEC SA2 via NNRC in the EAA

WL2351 = water supply from Lake Okeechobee (thru S-351) to LEC SA2 via Hillsboro canal in the EAA

WL3351 = water supply from Lake Okeechobee (thru S-351) to LEC SA3 via NNRC thru S-150 in the EAA

WLC351 = water supply discharges to LEC from Lake Okeechobee via S-351

WLC352 = water supply discharges to LEC from Lake Okeechobee via S-352

WLC354 = water supply discharges to LEC from Lake Okeechobee via S-354

WLES6 = portion of untreated runoff from Hillsboro basin in the EAA used to meet SA-1 demands in the LEC via existing S6 *(=0 in 2006 ECP simulation)*

WLES7 = portion of untreated runoff from NNRC basin in the EAA used to meet SA-2 demands in the LEC via existing S7

WLES8 = portion of untreated runoff from MAIMI basin in the EAA used to meet SA-3 demands in the LEC via existing S8

WSEAA = total water supply releases from Lake Okeechobee to meet EAA irrigation requirements

WSHOLY = water supply (environmental) releases from Lake Okeechobee to Holeyland

WSL8S = water supply discharges from WCA-1 to L-8/M-canal

WSST1E = water supply (environmental) discharge to STA-1E from Lake Okeechobee to maintain minimum levels *(replaced with two new terms in ECP 2006 simulation, see end of this glossary)*

WSST1W = water supply (environmental) discharge from Lake Okeechobee to STA-1W

WSSTA = total water supply (environmental) discharge from Lake Okeechobee to STAs to maintain minimum levels

WSSTA2 = water supply (environmental) discharge from Lake Okeechobee to STA2 *(replaced with three new terms in ECP 2006 simulation, see end of this glossary)*

WSSTA3 = water supply (environmental) discharge from Lake Okeechobee to STA-3&4

WSSTA5 = water supply (environmental) discharge from Lake Okeechobee to STA5

WSSTA6 = water supply (environmental) discharge from Lake Okeechobee to STA6 via S-354 and Miami canal

The following new structure definitions were added in the ECP 2006 simulation and are not listed in the SFWMM v5.0 Glossary posted on the CERPZONE website:

715FLK = flow from 715 Farms to Lake Okeechobee

715ST2 = flow from 715 Farms to STA-2

EBDST1 = flow from East Beach Water Control District to STA-1

EBDTLK = flow from East Beach Water Control District to Lake Okeechobee

ESDST2 = flow from East Shore Water Control District to STA-2

ESDTLK = flow from East Shore Water Control District to Lake Okeechobee

SSDST3 = flow from South Shore 298 Districts to STA-3

SSDTLK = flow from South Shore 298 Districts to Lake Okeechobee

WSST2E = water supply discharge from Lake O. to eastern portion of STA-2

WSST2M = water supply discharge from Lake O. to middle portion of STA-2

WSST2W = water supply discharge from Lake O. to western portion of STA-2

WST1EE = water supply discharge from Lake O. to eastern portion of STA-1E

WST1EW = water supply discharge from Lake O. to western portion of STA-1E

2. SUMMARY OF STA INFLOWS FROM SIMULATION RESULTS

Results of the SFWMM 2006 simulation were originally furnished by the SFWMD in the form of an Excel spreadsheet (ECP2006_032905_timeseries.xls dated April 4, 2005). That spreadsheet included selected data from the simulation associated primarily with stormwater treatment area inflows and outflows. Summaries of the simulated inflows to each of the six stormwater treatment areas of the ECP are presented in Tables 2.1 through 2.6. Overall summaries are presented in Tables 2.7 (all inflows) and 2.8 (Lake releases only).

Table 2.1 Simulated Annual Inflows to STA-1E

Water Year	Simulated Inflow Volume in Acre-Feet by Source					
	S1324P (at S-361)	S319*	L101**	Lake Okeechobee		TOTAL
			ST1EI1	WST1EE	WST1EW	
1966	9,145	212,804	64,727	209	50	286,934
1967	9,133	277,381	67,344	0	0	353,857
1968	7,818	123,625	21,622	0	0	153,065
1969	9,619	358,277	120,050	0	0	487,946
1970	10,754	353,646	100,762	0	0	465,161
1971	6,964	156,394	44,011	0	0	207,368
1972	8,674	142,183	36,600	0	163	187,620
1973	7,883	147,198	13,563	0	0	168,643
1974	8,273	129,975	20,853	0	0	159,102
1975	7,878	161,998	44,930	0	0	214,806
1976	8,721	145,122	58,182	0	0	212,025
1977	8,044	113,580	33,698	0	0	155,322
1978	9,324	154,606	51,586	0	0	215,515
1979	9,077	337,584	54,682	0	0	401,343
1980	9,306	197,219	44,873	0	0	251,398
1981	7,479	112,550	30,690	0	0	150,718
1982	8,516	138,441	58,646	0	0	205,603
1983	10,390	405,861	95,603	0	0	511,854
1984	9,093	330,280	76,568	0	0	415,941
1985	7,932	228,463	54,519	0	0	290,914
1986	10,046	160,248	39,524	0	0	209,818
1987	9,342	160,333	48,402	0	0	218,076
1988	8,641	171,864	43,531	0	0	224,035
1989	6,931	158,884	55,120	0	0	220,935
1990	6,928	78,774	23,613	0	0	109,316
1991	9,237	155,818	39,839	0	0	204,894
1992	8,846	186,681	10,526	0	0	206,053
1993	9,626	443,107	103,465	0	0	556,199
1994	8,648	186,532	76,246	0	0	271,425
1995	7,713	484,401	100,859	0	0	592,973
1996	7,844	345,457	62,801	0	0	416,102
1997	9,850	238,746	24,556	0	0	273,152
1998	10,513	301,638	24,313	0	0	336,464
1999	8,237	221,967	56,766	0	0	286,970
2000	8,218	278,205	47,643	0	0	334,065
Max. Annual	10,754	484,401	120,050	209	163	592,973
Min. Annual	6,928	78,774	10,526	0	0	109,316
Ave. Annual	8,704	222,853	52,878	6	6	284,446

* S-319 Includes inflows from C-51 West Basin, L-8 Basin, Acme Basins A and B, and Loxahatchee Groves Water Control District

**L101 is the STA-1 Inflow Basin - sources of inflow to L101 can include S-5A Basin and L-8 Basin runoff; East Beach Water Control District discharges; and Lake releases

Table 2.2 Simulated Annual Inflows to STA-1W

Water Year	Simulated Inflow Vol. in Ac-Ft by Source		
	From L101*	Lake O.	TOTAL
	ST1WI1	WSST1W	
1966	218,194	0	218,194
1967	192,678	0	192,678
1968	153,808	0	153,808
1969	246,273	0	246,273
1970	257,773	0	257,773
1971	148,258	0	148,258
1972	209,055	0	209,055
1973	121,340	0	121,340
1974	136,863	0	136,863
1975	158,715	0	158,715
1976	178,836	0	178,836
1977	153,081	0	153,081
1978	173,645	0	173,645
1979	271,575	0	271,575
1980	179,929	0	179,929
1981	113,992	0	113,992
1982	107,329	0	107,329
1983	227,882	0	227,882
1984	191,364	0	191,364
1985	137,856	0	137,856
1986	171,331	0	171,331
1987	187,150	0	187,150
1988	135,779	0	135,779
1989	118,860	0	118,860
1990	125,205	0	125,205
1991	167,540	0	167,540
1992	153,589	0	153,589
1993	237,338	0	237,338
1994	182,329	0	182,329
1995	271,938	0	271,938
1996	183,720	0	183,720
1997	178,538	0	178,538
1998	231,384	0	231,384
1999	126,292	0	126,292
2000	185,981	0	185,981
Max. Annual	271,938	0	271,938
Min. Annual	107,329	0	107,329
Ave. Annual	178,155	0	178,155

*L101 is the STA-1 Inflow Basin south of S-5A

Table 2.3 Simulated Annual Inflows to STA-2

Water Year	Simulated Inflow Volume in acre-feet by Source				
	Total Runoff	Water Supply from Lake Okeechobee for STA Irrigation			TOTAL
	RFTST2*	WSST2E	WSST2M	WSST2W	
1966	303,908	0	0	620	304,528
1967	324,773	0	0	0	324,773
1968	227,566	525	0	406	228,497
1969	410,714	0	0	0	410,714
1970	424,426	0	0	0	424,426
1971	209,527	0	0	0	209,527
1972	324,016	0	0	0	324,016
1973	214,487	0	0	0	214,487
1974	178,932	0	0	0	178,932
1975	242,256	0	0	0	242,256
1976	313,666	0	0	0	313,666
1977	233,861	0	0	0	233,861
1978	272,709	0	0	63	272,771
1979	320,777	0	0	0	320,777
1980	323,397	0	0	0	323,397
1981	166,339	0	0	0	166,339
1982	217,926	0	0	0	217,926
1983	404,610	0	0	0	404,610
1984	237,201	0	0	0	237,201
1985	198,863	0	0	0	198,863
1986	273,321	0	0	0	273,321
1987	265,243	0	0	0	265,243
1988	179,575	0	0	0	179,575
1989	162,185	0	0	0	162,185
1990	166,370	0	0	0	166,370
1991	227,334	0	0	0	227,334
1992	201,192	0	0	0	201,192
1993	344,969	0	0	0	344,969
1994	261,965	0	0	0	261,965
1995	374,719	0	0	0	374,719
1996	266,130	0	0	0	266,130
1997	212,243	0	0	0	212,243
1998	280,684	0	0	0	280,684
1999	177,887	0	0	0	177,887
2000	270,991	0	0	0	270,991
Max. Annual	424,426	525	0	620	425,571
Min. Annual	162,185	0	0	0	162,185
Ave. Annual	263,279	15	0	31	263,325

*RFTST2 includes runoff from S-2/S-6 basin; East Shore Water Control District and 715 Farms; and that part of S-5A Basin diverted to STA-2

Table 2.4 Simulated Annual Inflows to STA-3/4

Water Year	Simulated Inflow Volume in Acre Feet by Source					
	Lake Reg. 354RG	Lake WS FLIMPM	Runoff* MIAST3	Lake Reg. NNRCRG	Runoff NNRST3	TOTAL
1966	72,192	1,344	323,402	51,328	302,213	750,479
1967	133,854	0	277,804	109,043	314,688	835,389
1968	0	3,352	255,803	0	223,765	482,920
1969	206,377	0	420,437	163,163	351,811	1,141,788
1970	197,218	0	408,754	163,697	389,039	1,158,708
1971	87,291	0	187,257	63,011	193,575	531,134
1972	0	0	301,961	0	320,976	622,937
1973	0	2,508	170,411	0	232,137	405,055
1974	0	60	139,674	0	188,813	328,547
1975	39,576	0	265,637	35,538	228,123	568,875
1976	0	1,812	312,938	0	303,948	618,698
1977	0	0	181,549	0	242,710	424,259
1978	1,645	3,638	266,736	0	254,837	526,856
1979	113,325	0	332,634	90,585	319,509	856,053
1980	352,042	0	302,749	254,640	327,764	1,237,195
1981	26,749	0	104,048	15,453	177,381	323,631
1982	0	1,365	135,661	0	214,254	351,280
1983	98,042	1,523	432,550	82,568	340,146	954,829
1984	62,087	0	254,989	52,643	208,948	578,667
1985	45,141	238	167,128	32,380	193,953	438,840
1986	0	9,727	231,572	0	280,475	521,774
1987	42,855	0	301,702	33,640	251,693	629,890
1988	59,806	0	189,522	49,051	164,869	463,248
1989	0	2,213	175,790	0	148,044	326,047
1990	0	18,884	138,787	0	170,039	327,710
1991	0	9,087	202,980	0	213,550	425,616
1992	159,782	0	279,873	138,476	204,246	782,377
1993	182,750	0	282,883	153,477	324,135	943,245
1994	70,821	0	222,401	52,986	260,248	606,455
1995	62,769	0	374,612	57,560	352,269	847,209
1996	199,767	0	302,742	171,273	232,816	906,598
1997	103,557	0	272,067	84,256	207,859	667,740
1998	221,834	0	313,743	187,716	280,929	1,004,221
1999	92,986	0	179,236	80,706	169,424	522,352
2000	39,012	0	325,927	31,155	260,772	656,866
Max. Annual	352,042	18,884	432,550	254,640	389,039	1,237,195
Min. Annual	0	0	104,048	0	148,044	323,631
Ave. Annual	76,328	1,593	258,170	61,553	252,856	650,500

*MIAST3 includes S-3/S-8 Basin runoff; runoff from South Shore Drainage District and S-236 Basin; and runoff from C-139 Basin discharged through G-136

Table 2.5 Simulated Annual Inflows to STA-5

Water Year	Simulated Annual Flow in Ac.-Ft.		
	C-139 Runoff to STA-5*	Lake Water Supply	Total Inflow to STA-5
	STA5IQ	WSST5E	
1966	198,729	0	198,729
1967	176,384	0	176,384
1968	162,892	0	162,892
1969	193,892	0	193,892
1970	258,572	0	258,572
1971	74,091	2,524	76,615
1972	145,266	450	145,715
1973	24,303	0	24,303
1974	106,260	0	106,260
1975	164,046	0	164,046
1976	200,521	0	200,521
1977	83,545	0	83,545
1978	123,988	0	123,988
1979	230,836	0	230,836
1980	171,534	0	171,534
1981	51,199	0	51,199
1982	43,876	0	43,876
1983	263,413	0	263,413
1984	121,821	0	121,821
1985	55,987	0	55,987
1986	91,939	0	91,939
1987	110,491	0	110,491
1988	82,343	0	82,343
1989	64,845	0	64,845
1990	44,390	0	44,390
1991	41,842	0	41,842
1992	91,304	0	91,304
1993	125,621	0	125,621
1994	116,358	0	116,358
1995	236,266	0	236,266
1996	206,103	0	206,103
1997	151,441	0	151,441
1998	149,154	0	149,154
1999	122,057	0	122,057
2000	168,780	0	168,780
Max. Annual	263,413	2,524	263,413
Min. Annual	24,303	0	24,303
Ave. Annual	132,974	85	133,059

* Part of C-139 Basin runoff bypasses STA-5 as ST5REX, see Table 2.6.

Table 2.6 Simulated Annual Inflows to STA-6

Water Year	Simulated Annual Volume in Acre-Feet					
	STA-5 Bypass	Water Supply	USSC Unit 2	C-139 Annex	STA-6 Bypass	Total Inflow
	ST5REX	WSSTA6	SUGRF	U1TL28	ST6REX	STA6IQ
1966	0	1,355	6,255	17,885	0	25,495
1967	0	1,546	16,680	16,691	0	34,918
1968	0	1,497	6,604	14,908	0	23,009
1969	1,804	185	20,218	17,665	0	39,872
1970	7,022	0	30,430	19,744	0	57,196
1971	0	1,793	15,686	6,990	0	24,468
1972	0	688	6,741	13,952	0	21,382
1973	0	1,709	5,867	2,060	0	9,636
1974	4,728	3,511	5,374	10,731	0	24,343
1975	54,198	2,228	10,792	21,459	499	88,178
1976	12,048	1,742	10,079	20,693	0	44,563
1977	0	925	7,821	7,988	0	16,733
1978	209	558	10,548	10,478	0	21,793
1979	0	0	16,713	19,986	0	36,698
1980	0	0	11,633	13,872	0	25,505
1981	0	1,196	4,325	3,957	0	9,478
1982	0	2,131	3,813	3,805	0	9,749
1983	26,414	549	22,647	26,241	0	75,851
1984	0	0	5,746	10,982	0	16,727
1985	0	1,904	1,754	5,154	0	8,812
1986	0	829	10,138	8,601	0	19,568
1987	0	965	10,320	10,187	0	21,472
1988	0	779	6,442	5,332	0	12,553
1989	0	2,280	4,071	5,792	0	12,143
1990	0	1,077	3,526	3,791	0	8,394
1991	0	737	790	3,293	0	4,820
1992	0	0	21,277	7,808	0	29,085
1993	0	957	15,723	11,423	0	28,102
1994	0	0	10,244	10,761	0	21,005
1995	0	0	22,320	18,016	0	40,335
1996	8,866	423	14,300	19,710	0	43,298
1997	0	407	7,953	13,536	0	21,896
1998	0	0	13,921	11,081	0	25,002
1999	0	1,411	7,555	9,379	0	18,345
2000	0	681	20,387	15,579	0	36,646
Max. Annual	54,198	3,511	30,430	26,241	499	88,178
Min. Annual	0	0	790	2,060	0	4,820
Ave. Annual	3,294	973	11,105	11,987	14	27,345

Table 2.7 Total Simulated Inflows to STAs

Water Year	Simulated Annual Inflow in Acre-Feet (All Sources)						
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	TOTAL
1966	286,934	218,194	304,528	750,479	198,729	25,495	1,784,360
1967	353,857	192,678	324,773	835,389	176,384	34,918	1,917,999
1968	153,065	153,808	228,497	482,920	162,892	23,009	1,204,191
1969	487,946	246,273	410,714	1,141,788	193,892	39,872	2,520,486
1970	465,161	257,773	424,426	1,158,708	258,572	57,196	2,621,835
1971	207,368	148,258	209,527	531,134	76,615	24,468	1,197,370
1972	187,620	209,055	324,016	622,937	145,715	21,382	1,510,725
1973	168,643	121,340	214,487	405,055	24,303	9,636	943,465
1974	159,102	136,863	178,932	328,547	106,260	24,343	934,048
1975	214,806	158,715	242,256	568,875	164,046	88,178	1,436,876
1976	212,025	178,836	313,666	618,698	200,521	44,563	1,568,308
1977	155,322	153,081	233,861	424,259	83,545	16,733	1,066,802
1978	215,515	173,645	272,771	526,856	123,988	21,793	1,334,569
1979	401,343	271,575	320,777	856,053	230,836	36,698	2,117,283
1980	251,398	179,929	323,397	1,237,195	171,534	25,505	2,188,958
1981	150,718	113,992	166,339	323,631	51,199	9,478	815,357
1982	205,603	107,329	217,926	351,280	43,876	9,749	935,763
1983	511,854	227,882	404,610	954,829	263,413	75,851	2,438,438
1984	415,941	191,364	237,201	578,667	121,821	16,727	1,561,721
1985	290,914	137,856	198,863	438,840	55,987	8,812	1,131,273
1986	209,818	171,331	273,321	521,774	91,939	19,568	1,287,752
1987	218,076	187,150	265,243	629,890	110,491	21,472	1,432,322
1988	224,035	135,779	179,575	463,248	82,343	12,553	1,097,533
1989	220,935	118,860	162,185	326,047	64,845	12,143	905,016
1990	109,316	125,205	166,370	327,710	44,390	8,394	781,385
1991	204,894	167,540	227,334	425,616	41,842	4,820	1,072,047
1992	206,053	153,589	201,192	782,377	91,304	29,085	1,463,601
1993	556,199	237,338	344,969	943,245	125,621	28,102	2,235,474
1994	271,425	182,329	261,965	606,455	116,358	21,005	1,459,537
1995	592,973	271,938	374,719	847,209	236,266	40,335	2,363,441
1996	416,102	183,720	266,130	906,598	206,103	43,298	2,021,952
1997	273,152	178,538	212,243	667,740	151,441	21,896	1,505,010
1998	336,464	231,384	280,684	1,004,221	149,154	25,002	2,026,908
1999	286,970	126,292	177,887	522,352	122,057	18,345	1,253,902
2000	334,065	185,981	270,991	656,866	168,780	36,646	1,653,330
Max. Annual	592,973	271,938	425,571	1,237,195	263,413	88,178	2,621,835
Min. Annual	109,316	107,329	162,185	323,631	24,303	4,820	781,385
Ave. Annual	284,446	178,155	263,325	650,500	133,059	27,345	1,536,830

Table 2.8 Simulated STA Inflows from Lake Okeechobee

Water Year	Simulated Annual Inflow in Acre-Feet (Lake Releases Only)						
	STA-1E	STA-1W	STA-2	STA-3/4	STA-5	STA-6	TOTAL
1966	259	0	620	124,864	0	1,355	127,098
1967	0	0	0	242,897	0	1,546	244,444
1968	0	0	931	3,352	0	1,497	5,780
1969	0	0	0	369,540	0	185	369,725
1970	0	0	0	360,915	0	0	360,915
1971	0	0	0	150,302	2,524	1,793	154,618
1972	163	0	0	0	450	688	1,301
1973	0	0	0	2,508	0	1,709	4,217
1974	0	0	0	60	0	3,511	3,571
1975	0	0	0	75,115	0	2,228	77,342
1976	0	0	0	1,812	0	1,742	3,553
1977	0	0	0	0	0	925	925
1978	0	0	63	5,283	0	558	5,903
1979	0	0	0	203,910	0	0	203,910
1980	0	0	0	606,682	0	0	606,682
1981	0	0	0	42,202	0	1,196	43,398
1982	0	0	0	1,365	0	2,131	3,496
1983	0	0	0	182,133	0	549	182,682
1984	0	0	0	114,730	0	0	114,730
1985	0	0	0	77,759	0	1,904	79,663
1986	0	0	0	9,727	0	829	10,556
1987	0	0	0	76,495	0	965	77,460
1988	0	0	0	108,857	0	779	109,636
1989	0	0	0	2,213	0	2,280	4,493
1990	0	0	0	18,884	0	1,077	19,961
1991	0	0	0	9,087	0	737	9,824
1992	0	0	0	298,258	0	0	298,258
1993	0	0	0	336,226	0	957	337,183
1994	0	0	0	123,807	0	0	123,807
1995	0	0	0	120,329	0	0	120,329
1996	0	0	0	371,040	0	423	371,463
1997	0	0	0	187,813	0	407	188,220
1998	0	0	0	409,549	0	0	409,549
1999	0	0	0	173,693	0	1,411	175,103
2000	0	0	0	70,167	0	681	70,847
Max. Annual	259	0	931	606,682	2,524	3,511	606,682
Min. Annual	0	0	0	0	0	0	925
Ave. Annual	12	0	46	139,474	85	973	140,590

As developed in the 2006 ECP simulation, the above volumes are limited to Lake Okeechobee regulatory releases and water supply releases to the STAs necessary to maintain them in a hydrated condition (e.g., STA irrigation).

A comparison of average annual STA inflows taken from the ECP 2006 simulation to those taken from earlier analyses is presented Table 2.9.

Table 2.9 Comparison of Estimated Average Annual STA Inflows

Location	Average Annual Inflow Volume in 1,000 Acre Feet								
	This Simulation			Long-Term Plan			Draft Supp. Analysis		
	Lake	Other	Total	Lake	Other	Total	Lake	Other	Total
STA-1E	0	284	284	1	164	165	0	172	172
STA-1W	0	178	178	20	140	160	102	283	385
STA-2	0	263	263	2	232	234	42	294	335
STA-3/4	139	511	650	232	429	661	85	483	567
STA-5	0	133	133	0	132	132	0	170	170
STA-6	1	26	27	1	37	38	0	93	93
Total	**141**	**1,396**	**1,537**	**256**	**1,133**	**1,390**	**228**	**1,495**	**1,723**

The values shown for the "Long-Term Plan" are actually taken from an October 2002 *Evaluation of Alternatives for the ECP Basins*, prepared for SFWMD by Burns & McDonnell, for hydrologic conditions expected to exist in the period 2004-2006. Those values resulted from analysis of 31 years of SFWMM simulated data (calendar years 1965-1995). They would not reflect any influence of the conversion of lands to use in expanded STA-2 and STA-5.

The values shown for the "Draft Supp. Analysis" resulted from analysis of 10 years of record data that had been adjusted in an attempt to reflect the influence of changed land use and basin conditions (primarily for the conversion of lands to use in stormwater treatment areas) during that period. They do not reflect any influence of the conversion of lands to use in expanded STA-2 and STA-5. In addition, the Lake release volumes for that case do not reflect the influence of system management changes (such as elimination of Lake Okeechobee regulatory releases to the West Palm Beach Canal) already instituted by the SFWMD.

The values for both the Long-Term Plan and the "Draft Supp. Analysis" exclude any potential inflows from the L-8 Basin; the 2006 ECP simulation includes L-8 Basin runoff through S-5AE in potential inflows to STA-1E.

Given the disparity between periods considered and overall system operations inherent in the three estimates (particularly with respect to the character, quantity and location of Lake Okeechobee releases), the comparison presented in Table 2.9, while of interest, should be

considered with caution. A more specific comparison and evaluation by source is considered more appropriate and is presented in the following sections of this document.

3. SUMMARY OF SIMULATED BASIN RUNOFF VOLUMES

This section presents a summary of the simulated discharge volumes by source and location taken from the results of the SFWMD's 2006 ECP simulation. The spreadsheet originally furnished by the SFWMD on April 4, 2005 was not sufficiently inclusive as to permit the analysis summarized herein. On May 1, 2005, the SFWMD furnished a complete dss (data storage system) file of all mean daily structure discharges computed in the simulation, which was then converted by Burns & McDonnell to an Excel file for direct use in this analysis.

The simulated mean daily discharges resulting from the 2006 ECP simulation are summarized by the following sources:

- Chapter 298 Districts on the east and south shores of Lake Okeechobee, including:
  - The East Beach Water Control District;
  - The East Shore Water Control District;
  - The 715 Farms;
  - The South Shore Drainage District;
  - The S-236 Basin (South Florida Conservancy District).
- The S-2/S-6/S-7 Basin of the EAA;
- The S-3/S-8 Basin of the EAA;
- The S-5A Basin of the EAA;
- The C-139 Basin;
- The C-139 Annex;
- The C-51 West Basin and certain other areas tributary to the C-51 West Canal;
- The L-8 Basin;
- Lake Okeechobee.

Part 4 of this document compares those simulation results to previous estimates; Part 6 presents an evaluation of the differences.

3.1. Chapter 298 Districts

An annual summary of the total simulated discharge volumes from the five Chapter 298 districts considered in this analysis is presented in Table 3.1. This summary includes both simulated discharges to Lake Okeechobee, and simulated discharges south to the primary canals of the EAA and, eventually, to the stormwater treatment areas.

Table 3.1 Simulated Annual Runoff from 298 Districts

Water Year	Simulated Runoff Volume in Acre-Feet									
	715 Farms		East Beach WCD		East Shore WCD		S-236 (SFCD)		South Shore DD	
	715FLK To Lake	715ST2 To STA	EBDST1 To STA	EBDTLK To Lake	ESDST2 To STA	ESDTLK To Lake	S236RO To Lake	S236SO To STA	SSDST3 To STA	SSDTLK To Lake
1966	5,965	1,767	2,917	11,817	4,616	14,020	11,905	12,190	4,052	5,627
1967	5,247	1,208	1,863	10,032	3,670	11,255	7,578	11,040	3,834	3,994
1968	3,371	726	1,611	6,197	1,835	8,032	7,576	6,263	2,091	3,382
1969	8,680	1,467	1,833	16,988	4,520	19,292	14,526	16,727	5,593	7,021
1970	8,746	1,653	3,276	16,067	4,480	19,801	14,632	14,058	4,705	8,002
1971	3,866	1,346	2,646	7,432	3,422	9,435	7,212	10,025	3,332	3,270
1972	6,076	1,568	2,353	12,286	5,848	12,720	13,588	10,331	3,492	6,108
1973	2,547	1,108	2,744	4,317	3,405	5,549	4,029	8,955	2,980	1,650
1974	2,194	1,222	2,049	4,441	3,068	5,157	3,729	6,401	2,119	2,138
1975	3,662	1,429	2,677	7,062	3,826	8,490	6,964	10,584	3,705	2,689
1976	4,192	2,684	5,043	8,138	6,812	9,949	9,256	12,989	4,440	4,200
1977	3,227	1,396	2,734	6,203	4,068	7,335	5,522	10,235	3,490	2,365
1978	5,296	1,317	1,979	10,578	3,693	12,219	9,413	10,383	3,452	4,785
1979	6,245	2,004	3,056	12,681	5,409	14,477	10,205	17,255	5,764	4,703
1980	4,858	1,239	2,554	9,120	3,427	11,383	8,997	10,265	3,443	4,211
1981	1,674	637	1,344	3,123	1,656	4,044	1,663	6,724	2,220	706
1982	2,799	655	988	5,517	1,698	6,493	4,039	6,851	2,262	2,010
1983	7,397	1,201	1,737	14,449	3,371	17,009	15,970	8,925	3,070	7,558
1984	4,563	2,498	2,797	10,675	7,004	9,939	7,414	14,614	5,180	3,666
1985	4,295	758	1,717	7,935	2,639	9,566	7,316	7,752	2,709	3,622
1986	4,714	794	2,482	7,996	2,066	11,193	7,558	10,035	3,449	3,426
1987	4,251	1,327	2,509	8,275	4,121	9,620	9,470	7,626	2,929	4,136
1988	3,126	992	1,429	6,343	2,617	7,191	5,185	6,722	2,305	2,797
1989	2,687	1,728	1,584	6,925	4,506	6,255	5,234	10,007	3,328	2,252
1990	2,198	1,001	1,512	4,673	2,572	5,319	3,267	7,745	2,608	1,444
1991	3,783	1,200	1,937	7,468	3,737	8,154	7,668	6,710	2,387	3,785
1992	2,240	2,339	2,617	6,233	6,260	4,976	4,774	12,296	4,116	1,684
1993	7,645	912	1,793	14,261	3,286	16,925	9,900	17,523	5,879	5,035
1994	5,439	1,089	1,895	10,474	3,833	11,933	9,054	9,125	3,635	4,484
1995	7,206	1,283	2,079	13,991	3,790	16,550	11,613	13,366	4,548	5,996
1996	6,108	1,554	2,807	11,677	4,465	13,759	10,918	11,952	4,029	5,481
1997	4,243	1,143	1,545	8,753	3,315	9,770	8,894	8,647	3,226	3,526
1998	4,287	2,059	2,806	9,399	5,776	9,710	10,053	9,663	3,191	4,810
1999	3,869	754	1,776	6,821	2,393	8,412	6,108	6,759	2,232	3,415
2000	5,749	1,497	3,609	9,942	3,942	13,076	9,929	11,571	3,892	5,008
Max. Annual	8,746	2,684	5,043	16,988	7,004	19,801	15,970	17,523	5,879	8,002
Min. Annual	1,674	637	988	3,123	1,656	4,044	1,663	6,263	2,091	706
Ave. Annual	4,641	1,359	2,294	9,094	3,861	10,543	8,319	10,352	3,534	3,971

On an average annual basis, the 2006 ECP simulation resulted in an estimated total runoff volume from those five districts of 57,968 acre-feet per year, of which an average of 21,400 acre-feet per year (37% of the total) would be directed south, and an average of 36,568 acre-feet per year would be directed to Lake Okeechobee. As noted in Part 1, v5.0 of the SFWMM has not yet been calibrated to record discharges from the 298 districts. In addition, the separation of the total runoff to the five districts individually is a relatively recent addition to the model. The physical nature and operating characteristics of the diversion works as simulated may not be properly represented.

3.2. S-2/S-6/S-7 Basin

Total S-2/S-6/S-7 Basin runoff is distributed between seven possible outlets. Those outlets include Pumping Station S-2 (back pumping to Lake Okeechobee), Pumping Station S-6 and Pumping Station G-328 in the Hillsboro Canal basin (both of which discharge to STA-2), and outlets to the south from the North New River Canal. The primary outlet to the south from the North New River Canal Basin is Pumping Station G-370 (inflow pumping station for STA-3/4). Under some conditions in the simulation, there can also be basin discharges to the south at Pumping Station S-7 (to WCA-2A) and Structure S-150 (to WCA-3A).

3.2.1. Hillsboro Canal Basin Runoff Discharged to South

As simulated in the SFWMM, S-2/S-6/S-7 basin runoff in the Hillsboro Canal basin discharged to the south (either to STA-2 or to WCA-2A) can include the following:

- Basin runoff discharged at S-6/G-328 to STA-2. This term is not directly listed in the simulation output. It is computed as RFTST2-715ST2-ESDST2-DIVERS.
- WLES6 (which is equal to zero in the 2006 ECP simulation).

A summary of the simulated annual S-2/S-6/S-7 Basin runoff delivered to STA-2 via the Hillsboro Canal is presented in Table 3.2.

Table 3.2 Simulated Annual Runoff from Hillsboro Basin to STA-2

Water Year	Simulated Average Annual Volume in Acre-Feet				
	Basin Runoff to STA-2				
	RFTST2	715ST2	ESDST2	DIVERS	NET
1966	303,908	1,767	4,616	74,025	223,500
1967	324,773	1,208	3,670	67,631	252,264
1968	227,566	726	1,835	46,537	178,468
1969	410,714	1,467	4,520	95,342	309,385
1970	424,426	1,653	4,480	92,483	325,810
1971	209,527	1,346	3,422	48,461	156,298
1972	324,016	1,568	5,848	65,807	250,793
1973	214,487	1,108	3,405	35,778	174,196
1974	178,932	1,222	3,068	41,072	133,569
1975	242,256	1,429	3,826	53,255	183,746
1976	313,666	2,684	6,812	60,974	243,197
1977	233,861	1,396	4,068	49,251	179,146
1978	272,709	1,317	3,693	59,831	207,867
1979	320,778	2,004	5,409	80,326	233,038
1980	323,397	1,239	3,427	57,551	261,180
1981	166,339	637	1,656	37,397	126,649
1982	217,926	655	1,698	43,278	172,295
1983	404,610	1,201	3,371	84,293	315,745
1984	237,201	2,498	7,004	68,637	159,062
1985	198,863	758	2,639	49,274	146,192
1986	273,321	794	2,066	55,016	215,445
1987	265,243	1,327	4,121	61,305	198,490
1988	179,575	992	2,617	46,237	129,729
1989	162,185	1,728	4,506	46,979	108,972
1990	166,370	1,001	2,572	39,973	122,823
1991	227,334	1,200	3,737	53,575	168,824
1992	201,192	2,339	6,260	42,639	149,955
1993	344,969	912	3,286	86,337	254,434
1994	261,965	1,089	3,833	64,402	192,641
1995	374,719	1,283	3,790	92,474	277,172
1996	266,130	1,554	4,465	61,180	198,930
1997	212,243	1,143	3,315	53,531	154,254
1998	280,684	2,059	5,776	66,462	206,387
1999	177,887	754	2,393	41,376	133,363
2000	270,991	1,497	3,942	54,266	211,287
Max. Annual	424,426	2,684	7,004	95,342	325,810
Min. Annual	162,185	637	1,656	35,778	108,972
Ave. Annual	263,279	1,359	3,861	59,342	198,717

3.2.2. North New River Canal Basin Runoff Delivered to South

As simulated in the SFWMM, North New River Canal (NNRC) basin runoff discharged to the south can include the following terms:

- NNRST3 (NNRC Basin runoff routed to STA-3/4 through the North New River Canal and G-370);
- S7BPMR (emergency bypass of untreated EAA runoff around STA-3/4 through S-7 into WCA-2A);
- WLES7 (portion of untreated runoff from NNRC basin in the EAA used to meet SA-2 demands in the LEC via existing S7);

Table 3.3 summarizes the simulated annual runoff from the North New River Canal basin to the south for each of the above terms and total.

3.2.3. Total S-2/S-6/S-7 Basin Runoff

Total runoff from the S-2/S-6/S-7 basin runoff includes:

- Runoff discharged to STA-2 and/or WCA-2A at S-6 and G-328 (see Table 3.2);
- Runoff discharged to STA-3/4 at G-370 and to WCA-2A at S-7 (and WCA-3A at S-150), see Table 3.3;
- Runoff back pumped to Lake Okeechobee at S-2 (represented in the simulation by the term S2PMP).

The total simulated runoff from the basin over the period Water Years 1966-2000 is summarized annually in Table 3.4.

Table 3.3 Simulated Annual Runoff from NNRC Basin to South

Water Year	Simulated Average Annual Volume Basin Runoff Discharged to South			
	NNRST3	S7BPMR	WLES7	TOTAL
1966	302,213	0	0	302,213
1967	314,688	1,993	0	316,681
1968	223,765	0	101	223,867
1969	351,811	5,252	0	357,063
1970	389,039	1,734	0	390,772
1971	193,575	3,506	3	197,085
1972	320,977	0	156	321,133
1973	232,137	0	0	232,137
1974	188,814	0	0	188,814
1975	228,123	0	229	228,352
1976	303,948	0	0	303,948
1977	242,710	0	0	242,710
1978	254,838	1,708	0	256,546
1979	319,509	0	0	319,509
1980	327,764	0	0	327,764
1981	177,381	0	2	177,383
1982	214,254	1,903	0	216,157
1983	340,146	6,944	0	347,090
1984	208,948	0	0	208,948
1985	193,953	0	64	194,017
1986	280,475	0	94	280,569
1987	251,693	0	0	251,693
1988	164,869	0	0	164,869
1989	148,044	0	32	148,076
1990	170,039	0	274	170,313
1991	213,550	1,755	0	215,305
1992	204,246	0	0	204,246
1993	324,135	3,557	0	327,691
1994	260,248	0	0	260,248
1995	352,268	0	0	352,268
1996	232,816	8,469	0	241,285
1997	207,859	0	0	207,859
1998	280,929	0	0	280,929
1999	169,424	0	61	169,484
2000	260,772	0	183	260,955
Max. Annual	389,039	8,469	274	390,772
Min. Annual	148,044	0	0	148,076
Ave. Annual	252,856	1,052	34	253,942

Table 3.4 Total Simulated Runoff from S-2/S-6/S-7 Basin

Water Year	Simulated Annual Volume in Acre-Feet			
	To Lake	To South		BASIN
	S2PMP	Hillsboro	NNRC	TOTAL
1966	0	223,500	302,213	525,713
1967	88,813	252,264	316,681	657,758
1968	27,057	178,468	223,867	429,392
1969	121,482	309,385	357,063	787,930
1970	91,971	325,810	390,772	808,554
1971	33,935	156,298	197,085	387,318
1972	36,402	250,793	321,133	608,328
1973	45,186	174,196	232,137	451,519
1974	4,533	133,569	188,814	326,916
1975	30,721	183,746	228,352	442,820
1976	46,371	243,197	303,948	593,516
1977	5,836	179,146	242,710	427,692
1978	49,454	207,867	256,546	513,867
1979	799	233,038	319,509	553,345
1980	54,902	261,180	327,764	643,847
1981	112	126,649	177,383	304,144
1982	98,317	172,295	216,157	486,770
1983	159,133	315,745	347,090	821,967
1984	14,512	159,062	208,948	382,523
1985	28,026	146,192	194,017	368,235
1986	19,529	215,445	280,569	515,544
1987	19,020	198,490	251,693	469,203
1988	39,980	129,729	164,869	334,577
1989	7,356	108,972	148,076	264,404
1990	17,957	122,823	170,313	311,093
1991	64,661	168,824	215,305	448,789
1992	0	149,955	204,246	354,201
1993	71,431	254,434	327,691	653,556
1994	0	192,641	260,248	452,889
1995	92,210	277,172	352,268	721,650
1996	81,035	198,930	241,285	521,250
1997	2,579	154,254	207,859	364,692
1998	7,131	206,387	280,929	494,446
1999	65,029	133,363	169,484	367,876
2000	63,903	211,287	260,955	536,145
Max. Annual	159,133	325,810	390,772	821,967
Min. Annual	0	108,972	148,076	264,404
Ave. Annual	42,554	198,717	253,942	495,213

The simulated average annual runoff from the S-2/S-6/S-7 Basin over Water Years 1965-2000 is 495,213 acre-feet per year. Of that total, 452,659 acre-feet per year (91.4%) is directed south in the simulation, with the remaining 8.6% (42,554 acre-feet per year) back pumped to Lake Okeechobee at S-2.

3.3. S-3/S-8 Basin

No direct summary of total S-3/S-8 Basin runoff is available from the SFWMM output. It is necessary to develop that total by summing individual components that can be taken directly from the simulation output. Components of S-3/S-8 Basin in the SFWMM simulation include:

- Basin runoff included in simulated inflows to STA-3/4 (must be computed from the simulation results as MIAST3-SSDST3-S236SO-G136SO); this term appears to include G136EA;
- S3PMP (flow backpumped for flood control to Lake Okeechobee from EAA_MIAMI basin);
- S8BPMR (emergency bypass of untreated EAA runoff around STA-3/4 through S-8 into WCA-3A);
- WLES8 (portion of untreated runoff from S8 basin in the EAA used to meet SA-3 demands in the LEC via existing S8).

Annual summaries of the simulated total runoff from the S-3/S-8 Basin are presented in Table 3.5.

The simulated average annual runoff from the S-3/S-8 Basin over Water Years 1965-2000 is 238,629 acre-feet per year. Of that total, 232,708 acre-feet per year (97.5%) is directed south in the simulation, with the remaining 2.5% (5,921 acre-feet per year) back pumped to Lake Okeechobee at S-3.

Table 3.5 Simulated Annual Runoff from S-3/S-8 Basin

Water Year	Simulated Average Annual Volume in Acre-Feet								
	Basin Runoff to STA-3/4					To WCA-3A		To Lake	Basin
	MIAST3	SSDST3	S236SO	G136SO	NET	S8BPMR	WLES8	S3PMP	Total
1966	323,402	4,052	12,190	17,588	289,572	0	5,815	3,142	298,529
1967	277,804	3,834	11,040	19,274	243,655	0	0	27,397	271,052
1968	255,803	2,091	6,263	14,357	233,092	0	9	0	233,101
1969	420,437	5,593	16,727	17,677	380,440	0	0	6,702	387,142
1970	408,754	4,705	14,058	16,163	373,828	0	0	24,967	398,794
1971	187,257	3,333	10,025	6,240	167,659	0	0	0	167,659
1972	301,961	3,492	10,331	7,465	280,673	0	14,342	0	295,015
1973	170,410	2,980	8,955	5,089	153,386	0	0	0	153,386
1974	139,674	2,119	6,401	5,157	125,997	0	5,962	0	131,958
1975	265,637	3,705	10,584	28,988	222,361	0	1,183	173	223,717
1976	312,938	4,440	12,989	18,831	276,679	0	0	0	276,679
1977	181,549	3,490	10,235	5,216	162,607	0	0	0	162,607
1978	266,736	3,452	10,383	8,572	244,329	0	14	10,079	254,422
1979	332,634	5,765	17,255	9,487	300,128	0	0	0	300,128
1980	302,749	3,443	10,265	8,103	280,938	0	0	0	280,938
1981	104,048	2,220	6,724	1,943	93,161	0	0	0	93,161
1982	135,661	2,262	6,850	2,885	123,663	2,759	345	0	126,767
1983	432,550	3,070	8,925	49,318	371,237	0	55	24,650	395,942
1984	254,989	5,180	14,614	27,603	207,593	0	0	6,953	214,546
1985	167,128	2,709	7,752	5,923	150,744	0	2,998	0	153,741
1986	231,572	3,449	10,035	15,559	202,528	0	2,818	0	205,347
1987	301,702	2,929	7,626	29,385	261,761	0	0	455	262,216
1988	189,522	2,305	6,722	9,106	171,388	0	0	294	171,683
1989	175,790	3,328	10,007	5,792	156,663	0	5,294	0	161,957
1990	138,787	2,608	7,745	1,014	127,419	0	14,609	0	142,028
1991	202,980	2,387	6,710	2,631	191,253	0	760	26,026	218,039
1992	279,873	4,116	12,296	7,195	256,266	0	0	127	256,393
1993	282,883	5,879	17,523	9,378	250,104	0	0	16,587	266,690
1994	222,401	3,635	9,125	16,596	193,044	0	0	0	193,044
1995	374,612	4,548	13,366	27,454	329,244	0	0	2,228	331,472
1996	302,742	4,029	11,952	13,306	273,455	0	0	18,604	292,059
1997	272,067	3,226	8,647	7,225	252,969	0	0	0	252,969
1998	313,743	3,191	9,663	14,734	286,155	0	0	0	286,155
1999	179,236	2,232	6,760	9,881	160,363	0	0	25,773	186,135
2000	325,927	3,892	11,571	16,984	293,480	0	0	13,062	306,542
Max. Annual	432,550	5,879	17,523	49,318	380,440	2,759	14,609	27,397	398,794
Min. Annual	104,048	2,091	6,263	1,014	93,161	0	0	0	93,161
Ave. Annual	258,170	3,534	10,352	13,203	231,081	79	1,549	5,921	238,629

3.4. S-5A Basin

The total simulated runoff from the historic S-5A Basin consists of the sum of the following two terms in SFWMM, less the term EBDST1 (which is included in RFWPBB):

- RFWPBB (runoff from WPB basin in EAA);
- DIVERS (Diversion of runoff from WPB canal basin in EAA into Hillsboro Canal and STA-2, part of ECP).

An annual summary of the simulated basin runoff over Water Years 1966-2000 is presented in Table 3.6.

Table 3.6 Simulated Annual Runoff from S-5A Basin

Water Year	Total Basin Runoff in Acre-Feet				
	RFWPBB	EBST1	Net from S-5A Basin	DIVERS	TOTAL
1966	288,438	2,917	285,521	74,025	359,546
1967	278,177	1,863	276,314	67,631	343,946
1968	176,679	1,611	175,068	46,537	221,605
1969	374,134	1,833	372,301	95,342	467,643
1970	376,115	3,276	372,839	92,483	465,321
1971	185,864	2,646	183,218	48,461	231,680
1972	250,359	2,353	248,007	65,807	313,813
1973	137,336	2,744	134,592	35,778	170,370
1974	162,040	2,049	159,991	41,072	201,064
1975	206,602	2,677	203,925	53,255	257,180
1976	242,791	5,043	237,749	60,974	298,722
1977	188,012	2,734	185,277	49,251	234,528
1978	237,937	1,979	235,958	59,831	295,789
1979	309,245	3,056	306,189	80,326	386,516
1980	227,360	2,554	224,805	57,551	282,356
1981	145,947	1,344	144,603	37,397	182,000
1982	177,636	988	176,648	43,278	219,925
1983	327,960	1,737	326,223	84,293	410,516
1984	273,141	2,797	270,345	68,637	338,982
1985	208,441	1,717	206,723	49,274	255,997
1986	214,206	2,482	211,725	55,016	266,741
1987	236,664	2,509	234,156	61,305	295,461
1988	201,129	1,429	199,700	46,237	245,937
1989	182,545	1,584	180,960	46,979	227,939
1990	151,888	1,512	150,376	39,973	190,350
1991	221,585	1,937	219,649	53,575	273,223
1992	163,019	2,617	160,402	42,639	203,041
1993	364,619	1,793	362,826	86,337	449,163
1994	262,455	1,895	260,560	64,402	324,962
1995	381,868	2,079	379,789	92,474	472,263
1996	262,874	2,807	260,067	61,180	321,247
1997	202,923	1,545	201,378	53,531	254,909
1998	256,550	2,806	253,744	66,462	320,207
1999	196,509	1,776	194,733	41,376	236,109
2000	225,436	3,609	221,827	54,266	276,093
Max. Annual	381,868	5,043	379,789	95,342	472,263
Min. Annual	137,336	988	134,592	35,778	170,370
Ave. Annual	237,100	2,294	234,805	59,342	294,147

3.5. Total Runoff from EAA Basins

An annual summary of the simulated basin runoff from all the primary basins of the EAA over Water Years 1966-2000 is presented in Table 3.7.

Table 3.7 Simulated Runoff from EAA Basins

Water Year	Total Runoff Volume (acre-feet)			
	S-2/S-6/S-7	S-3/S-8	S-5A	TOTAL
1966	525,713	298,529	359,546	1,183,788
1967	657,758	271,052	343,946	1,272,756
1968	429,392	233,101	221,605	884,098
1969	787,930	387,142	467,643	1,642,715
1970	808,554	398,794	465,321	1,672,670
1971	387,318	167,659	231,680	786,656
1972	608,328	295,015	313,813	1,217,156
1973	451,519	153,386	170,370	775,276
1974	326,916	131,958	201,064	659,938
1975	442,820	223,717	257,180	923,717
1976	593,516	276,679	298,722	1,168,917
1977	427,692	162,607	234,528	824,827
1978	513,867	254,422	295,789	1,064,077
1979	553,345	300,128	386,516	1,239,989
1980	643,847	280,938	282,356	1,207,141
1981	304,144	93,161	182,000	579,304
1982	486,770	126,767	219,925	833,462
1983	821,967	395,942	410,516	1,628,425
1984	382,523	214,546	338,982	936,050
1985	368,235	153,741	255,997	777,973
1986	515,544	205,347	266,741	987,632
1987	469,203	262,216	295,461	1,026,880
1988	334,577	171,683	245,937	752,197
1989	264,404	161,957	227,939	654,300
1990	311,093	142,028	190,350	643,471
1991	448,789	218,039	273,223	940,051
1992	354,201	256,393	203,041	813,635
1993	653,556	266,690	449,163	1,369,409
1994	452,889	193,044	324,962	970,894
1995	721,650	331,472	472,263	1,525,385
1996	521,250	292,059	321,247	1,134,556
1997	364,692	252,969	254,909	872,571
1998	494,446	286,155	320,207	1,100,808
1999	367,876	186,135	236,109	790,121
2000	536,145	306,542	276,093	1,118,779
Max. Annual	821,967	398,794	472,263	1,672,670
Min. Annual	264,404	93,161	170,370	579,304
Ave. Annual	495,213	238,629	294,147	1,027,989

3.6. C-139 Basin

The C-139 Basin is not directly simulated in the SFWMM. Runoff from that source is input as a boundary condition to the simulation, and is based on data and methods summarized in a June 18, 2002, SFWMD memorandum from Luis Cadavid and Lehar Brion to Jayantha Obeysekera entitled *Western Boundary Flows at the L-1 and L-3 Canals for Simulation of the ECP Base (BASERR2R, SFWMM V3.8.2), ECP Future Base (2050wPROJ, SFWMM V4.4r6) and CERP Update (SFWMM V5.0).*

C-139 Basin runoff summarized in the output from the 2006 ECP simulation includes the following terms:

- G136EA (flow from outside model boundary to EAA_MIAMI basin);
- G136SO (portion of G136 flow routed south to STA-3/4);
- STA5IQ (inflow into STA-5 from runoff from Hendry County);
- ST5REX (inflow from western basins in excess of structure inlet capacity into STA-5).

The first two terms listed represent C-139 Basin discharges to the L-1E Canal at G-136, and represent potential inflows to STA-3/4. The second two terms represent C-139 Basin runoff to the L-3 Borrow Canal, and thus represent potential inflows to STA-5 and/or STA-6. Given that difference, the two primary points of discharge from the basin (G-136 and L-3) are summarized separately.

Annual summaries of the boundary condition inflows from the C-139 Basin to the SFWMM are presented in Table 3.8.

Table 3.8 Boundary Condition Runoff from C-139 Basin

Water Year	Total Basin Runoff in Acre-Feet					
	G136EA	G136SO	Total at G-136	STA5IQ	ST5REX	Total at L-3
1966	7,700	17,588	25,287	198,729	0	198,729
1967	6,084	19,274	25,358	176,384	0	176,384
1968	3,976	14,357	18,333	162,892	0	162,892
1969	7,939	17,677	25,617	193,892	1,804	195,696
1970	5,214	16,163	21,377	258,572	7,022	265,593
1971	1,227	6,240	7,467	74,091	0	74,091
1972	2,331	7,465	9,795	145,266	0	145,266
1973	902	5,089	5,991	24,303	0	24,303
1974	649	5,157	5,806	106,260	4,728	110,988
1975	13,016	28,988	42,004	164,046	54,198	218,244
1976	6,471	18,831	25,301	200,521	12,048	212,569
1977	599	5,216	5,815	83,545	0	83,545
1978	1,336	8,572	9,908	123,988	209	124,198
1979	2,043	9,487	11,530	230,836	0	230,836
1980	1,731	8,103	9,833	171,534	0	171,534
1981	155	1,943	2,097	51,199	0	51,199
1982	443	2,885	3,328	43,876	0	43,876
1983	19,516	49,318	68,833	263,413	26,414	289,826
1984	6,195	27,603	33,798	121,821	0	121,821
1985	1,188	5,923	7,111	55,987	0	55,987
1986	2,796	15,559	18,355	91,939	0	91,939
1987	9,404	29,385	38,790	110,491	0	110,491
1988	2,462	9,106	11,568	82,343	0	82,343
1989	2,170	5,792	7,962	64,845	0	64,845
1990	235	1,014	1,249	44,390	0	44,390
1991	867	2,631	3,498	41,842	0	41,842
1992	1,288	7,195	8,483	91,304	0	91,304
1993	2,293	9,378	11,671	125,621	0	125,621
1994	3,517	16,596	20,113	116,358	0	116,358
1995	8,533	27,454	35,986	236,266	0	236,266
1996	7,484	13,306	20,790	206,103	8,866	214,969
1997	5,866	7,225	13,091	151,441	0	151,441
1998	6,042	14,734	20,776	149,154	0	149,154
1999	3,853	9,881	13,734	122,057	0	122,057
2000	7,875	16,984	24,859	168,780	0	168,780
Max. Annual	19,516	49,318	68,833	263,413	54,198	289,826
Min. Annual	155	1,014	1,249	24,303	0	24,303
Ave. Annual	4,383	13,203	17,586	132,974	3,294	136,268

3.7. C-139 Annex

In the 2006 ECP simulation, discharges from the C-139 Annex are represented by the term "U1TL28". As was the case for the C-139 Basin, the C-139 Annex is not directly simulated in SFWMM; discharges from that source are input as boundary conditions to the simulation. Annual summaries of the C-139 Annex discharges taken from the 2006 ECP simulation are presented in Table 3.9.

Table 3.9 Boundary Condition Runoff from C-139 Annex

Water Year	Total Basin Runoff in Acre-Feet U1TL28
1966	17,885
1967	16,692
1968	14,907
1969	17,664
1970	19,744
1971	6,988
1972	13,950
1973	2,058
1974	10,729
1975	21,456
1976	20,691
1977	7,986
1978	10,477
1979	19,985
1980	13,871
1981	3,957
1982	3,803
1983	26,240
1984	10,981
1985	5,152
1986	8,600
1987	10,186
1988	5,332
1989	5,791
1990	3,789
1991	3,293
1992	7,808
1993	11,423
1994	10,761
1995	18,016
1996	19,710
1997	13,536
1998	11,080
1999	9,379
2000	15,579
Max. Annual	26,240
Min. Annual	2,058
Ave. Annual	11,986

3.8. USSC SDR Unit 2

In the 2006 ECP simulation, discharges from what once was the United States Sugar Corporation's Southern Division Ranch, Unit 2 are represented by the term "SUGRF". Annual summaries of simulated discharges for that area, taken from the 2006 ECP simulation, are presented in Table 3.10.

Table 3.10 Simulated Annual Runoff from Previous USSC SDR Unit 2

Water Year	Total Basin Runoff in Acre-Feet
	SUGRF
1966	6,254
1967	16,679
1968	6,603
1969	20,218
1970	30,429
1971	15,685
1972	6,741
1973	5,866
1974	5,373
1975	10,792
1976	10,079
1977	7,821
1978	10,548
1979	16,713
1980	11,633
1981	4,325
1982	3,813
1983	22,646
1984	5,746
1985	1,754
1986	10,138
1987	10,319
1988	6,441
1989	4,071
1990	3,526
1991	790
1992	21,277
1993	15,722
1994	10,243
1995	22,319
1996	14,299
1997	7,953
1998	13,921
1999	7,555
2000	20,386
Max. Annual	30,429
Min. Annual	790
Ave. Annual	11,105

3.9. Acme Improvement District Basin B

At present, Basin B of the Acme Improvement District discharges directly to the Loxahatchee National Wildlife Refuge (LNWR). In the 2006 ECP simulation, it has been assumed that Basin B no longer discharges to the LNWR; instead, discharges from that basin are routed north through Basin A of the Acme Improvement District to the C-51 West Canal. This runoff is included in the simulation results for the C-51 West Canal and basin, and will be further discussed in the following section.

3.10. C-51 West Basin

No direct identification of C-51 West Basin runoff is available from the SFWMM simulation results. It is necessary to estimate that runoff indirectly from the terms available in the simulation. That indirect estimation is based on an identification of C-51 West Canal inflows and outflows furnished by SFWMD.

3.10.1. C-51 West Canal Inflows

The 2006 ECP simulation includes the following inflows to the C-51 West Canal:

- L8C51W (flood control discharges from L-8 into C-51 West);
- LGROVQ (outflow from Loxahatchee Groves Water Control District to C-51W)
- S5A4 (flow from WPBC canal to C-51W Canal via S-5AE);
- S319WS (water supply to C-51 from STA-1E via S-319; *= 0 in the 2006 ECP simulation*);
- Q1WDN (flow from WELDN canal to C-51W);
- S1324W (weir discharging from Sections 13 and 24, T44S, R40E to C-51 Canal west of S-155A)
- ACME3 (flood control gravity discharge from Acme Basin A to C-51 Canal. Represents gravity discharge capability at Acme3 pump station);
- ACME4W (flood control pump discharging from Acme Basin A to C-51 Canal. Represents ACME4 pump station);
- ACMECU (flood control gravity discharge from Acme Basin B to Acme Basin A. Represents culverts under Pierson Road).

- ACME6 (flood control pump discharging from Acme Basin A to C-51 Canal west of S-155A. Represents Acme6 pump station).

Annual summaries of simulated inflows to the C-51 West Canal are presented in Table 3.11.

Table 3.11 Simulated Inflows to C-51 West Canal

Water Year	Simulated Inflow to C-51 West Canal in Acre-Feet									
	L8C51W	LGROVQ	S5A4	Q1WDN	S1324W	ACME3	ACME4W	ACME6	ACMECU	Total Inflow
1966	42,562	21,022	6,502	7,115	1,771	46,858	2,210	2,293	38,044	168,376
1967	106,886	19,203	5,980	10,741	2,929	46,262	1,238	1,285	38,530	233,054
1968	754	13,618	16,680	6,714	1,289	36,135	759	787	29,029	105,764
1969	168,232	22,478	1,076	13,957	2,477	45,152	3,129	3,247	39,497	299,244
1970	138,520	27,157	0	13,811	3,162	56,818	805	835	42,739	283,847
1971	66,581	10,036	20,041	5,306	409	27,485	0	0	20,318	150,177
1972	18,830	15,085	3,116	4,735	756	37,656	251	260	29,288	109,976
1973	3,939	14,789	4,279	6,146	1,790	41,124	1,680	1,743	32,505	107,996
1974	0	14,931	3,275	5,638	997	42,168	51	53	32,442	99,554
1975	51,932	12,665	12,867	6,494	1,122	33,254	0	0	26,847	145,180
1976	4,876	16,870	4,797	6,929	1,699	41,690	539	560	33,117	111,077
1977	0	12,864	6,545	5,502	755	35,080	0	0	25,760	86,507
1978	0	16,960	1,397	7,847	1,426	43,880	1,512	1,569	34,140	108,731
1979	185,499	20,420	2,446	11,157	1,547	44,059	0	0	33,112	298,241
1980	41,864	16,076	0	6,441	1,394	46,099	1,661	1,724	36,260	151,520
1981	13,087	10,172	8,722	3,937	191	33,560	0	0	23,873	93,542
1982	0	16,219	2,184	6,544	1,498	39,751	1,036	1,075	32,048	100,354
1983	178,431	30,622	0	15,604	2,668	59,995	1,440	1,494	44,328	334,582
1984	129,395	25,429	571	15,338	2,326	53,826	1,033	1,072	39,003	267,993
1985	88,662	18,111	1,486	7,803	661	40,050	971	1,008	28,127	186,880
1986	8,249	18,236	408	8,928	1,676	43,336	50	52	35,531	116,467
1987	8,633	17,717	4,582	7,411	1,388	44,825	609	632	34,303	120,100
1988	34,981	14,315	5,014	6,609	1,677	40,234	416	432	30,493	134,172
1989	46,416	12,301	4,254	7,079	1,068	33,747	96	100	24,936	129,998
1990	0	8,047	3,912	2,559	389	24,794	0	0	20,410	60,111
1991	223	19,358	246	8,293	1,292	44,178	513	532	33,819	108,455
1992	51,523	16,063	0	6,994	716	41,254	0	0	27,965	144,515
1993	254,036	25,989	6,767	13,915	3,016	50,166	375	389	37,498	392,150
1994	71,670	11,221	1,101	4,741	875	36,899	0	0	28,963	155,470
1995	265,064	26,260	0	18,743	6,941	53,770	703	730	40,554	412,766
1996	165,109	20,949	1,246	12,547	3,983	45,630	1,760	1,826	35,884	288,934
1997	70,180	20,484	0	9,841	1,765	47,990	2	2	35,219	185,482
1998	119,824	21,555	0	10,594	2,482	53,187	0	0	40,946	248,588
1999	88,690	16,835	11,247	8,027	2,328	39,106	273	283	32,907	199,697
2000	78,807	22,021	1,453	11,642	4,366	49,871	3,406	3,534	43,424	218,524
Max. Annual	265,064	30,622	20,041	18,743	6,941	59,995	3,406	3,534	44,328	412,766
Min. Annual	0	8,047	0	2,559	191	24,794	0	0	20,318	60,111
Ave. Annual	71,527	17,888	4,063	8,734	1,852	42,854	758	786	33,196	181,658

In the above tabulation, the term "ACMECU" is considered to represent Acme Improvement District Basin B discharges diverted from the LNWR to the C-51 West Canal.

3.10.2. C-51 West Canal Outflows

The 2006 ECP simulation includes the following outflows from the C-51 West Canal:

- S319 (flow from western C51 basin into STA-1E via S-319);

- S5A4 (flow from WPCB canal to C51W canal via S-5AE; these discharges are identical to those in the inflows, and are believed to represent water supply releases simply passed through the C-51 West Canal);
- C51LGQ (water supply to Loxahatchee Groves WCD from C-51;
- S155A (flow from C-51W canal to C-51 Canal).

Annual summaries of simulated outflows from the C-51 West Canal are presented in Table 3.12.

Table 3.12 Simulated Outflows from C-51 West Canal

Water Year	Simulated Outflow from C-51 West Canal in Acre-Feet				
	S319	S5A4	C51LGQ	S155A	Total Outflow
1966	212,804	6,502	1,243	53	220,680
1967	277,381	5,980	1,099	0	284,460
1968	123,625	16,680	2,124	934	143,453
1969	358,277	1,076	590	0	359,943
1970	353,646	0	399	0	354,045
1971	156,393	20,041	1,856	507	178,922
1972	142,183	3,116	956	23	146,279
1973	147,198	4,279	454	0	151,931
1974	129,975	3,275	1,290	0	134,540
1975	161,998	12,867	1,937	0	176,802
1976	145,122	4,797	1,380	0	151,302
1977	113,580	6,545	516	0	120,641
1978	154,606	1,397	403	0	156,405
1979	337,584	2,446	1,271	0	341,354
1980	197,219	0	1,253	0	198,471
1981	112,550	8,722	1,537	0	122,809
1982	138,441	2,184	1,460	0	142,085
1983	405,861	0	0	0	405,861
1984	330,280	571	541	0	331,393
1985	228,463	1,486	951	0	230,900
1986	160,248	408	376	0	161,032
1987	160,333	4,582	1,470	0	166,385
1988	171,863	5,014	2,131	0	179,009
1989	158,884	4,254	1,410	0	164,548
1990	78,774	3,912	1,889	0	84,575
1991	155,818	246	274	0	156,337
1992	186,682	0	135	0	186,817
1993	443,107	6,767	1,303	0	451,176
1994	186,532	1,101	698	0	188,331
1995	484,401	0	513	0	484,916
1996	345,457	1,246	1,769	0	348,472
1997	238,746	0	288	0	239,034
1998	301,638	0	207	0	301,844
1999	221,967	11,247	2,733	0	235,948
2000	278,205	1,453	1,078	0	280,737
Max. Annual	484,401	20,041	2,733	934	484,916
Min. Annual	78,774	0	0	0	84,575
Ave. Annual	222,853	4,063	1,072	43	228,041

3.10.3. Net Runoff from C-51 West Basin

The simulated inflows to the C-51 West Canal listed in Table 3.11 include the following terms representing discharge from areas included in the C-51 West Basin:

- LGROVQ (outflow from Loxahatchee Groves Water Control District to C-51W)
- Q1WDN (flow from WELDN canal to C-51W);
- S1324W (weir discharging from Sections 13 and 24, T44S, R40E to C-51 Canal west of S-155A)
- ACME3 (flood control gravity discharge from Acme Basin A to C-51 Canal. Represents gravity discharge capability at Acme3 pump station);
- ACME4W (flood control pump discharging from Acme Basin A to C-51 Canal. Represents ACME4 pump station);
- ACME6 (flood control pump discharging from Acme Basin A to C-51 Canal west of S-155A. Represents Acme6 pump station).

In addition to the above, the following term from the simulation represents runoff from the C-51 Basin not introduced to the C-51 West Canal, instead being pumped to STA-1E at S-361:

- S1324P (S-361 pump discharging from Sections 13 and 24, T44S, R40E to STA-1E for flood control.

The net runoff from the C-51 West Basin is computed as:

> Total outflow (Table 3.12) – Total inflow (Table 3.11) + S1324P + (LGROVQ + Q1WDN + S1324W + ACME3 + ACME4W + ACME6).

The final six terms in that formula are for this discussion defined as “Direct” in Table 3.13, which summarizes estimated annual runoff from the C-51 West Basin.

Table 3.13 Estimated Annual Runoff from C-51 West Basin

Water Year	Simulated Basin Runoff in Acre-Feet				
	C-51 W Canal Outflow (Table 3.12)	C-51 W Canal Inflow (Table 3.11)	"Direct" (see text)	S1324P	Net Basin Runoff
1966	220,680	168,376	81,268	9,145	142,717
1967	284,460	233,054	81,658	9,133	142,197
1968	143,453	105,764	59,301	7,818	104,808
1969	359,943	299,244	90,439	9,619	160,756
1970	354,045	283,847	102,588	10,754	183,540
1971	178,922	150,177	43,236	6,964	78,945
1972	146,279	109,976	58,742	8,674	103,719
1973	151,931	107,996	67,272	7,883	119,090
1974	134,540	99,554	63,837	8,274	107,097
1975	176,802	145,180	53,535	7,878	93,034
1976	151,302	111,077	68,287	8,721	117,233
1977	120,641	86,507	54,201	8,044	96,379
1978	156,405	108,731	73,194	9,324	130,192
1979	341,354	298,241	77,183	9,077	129,374
1980	198,471	151,520	73,396	9,306	129,653
1981	122,809	93,542	47,860	7,479	84,606
1982	142,085	100,354	66,122	8,516	116,369
1983	405,861	334,582	111,824	10,390	193,492
1984	331,393	267,993	99,024	9,093	171,517
1985	230,900	186,880	68,604	7,932	120,557
1986	161,032	116,467	72,279	10,046	126,890
1987	166,385	120,100	72,582	9,342	128,209
1988	179,009	134,172	63,684	8,641	117,161
1989	164,548	129,998	54,391	6,931	95,872
1990	84,575	60,111	35,789	6,928	67,181
1991	156,337	108,455	74,168	9,237	131,287
1992	186,817	144,515	65,026	8,846	116,174
1993	451,176	392,150	93,850	9,626	162,502
1994	188,331	155,470	53,736	8,648	95,245
1995	484,916	412,766	107,148	7,713	187,011
1996	348,472	288,934	86,695	7,844	154,077
1997	239,034	185,482	80,083	9,850	143,485
1998	301,844	248,588	87,818	10,513	151,587
1999	235,948	199,697	66,853	8,237	111,341
2000	280,737	218,524	94,839	8,218	165,270
Max. Annual	484,916	412,766	111,824	10,754	193,492
Min. Annual	84,575	60,111	35,789	6,928	67,181
Ave. Annual	228,041	181,658	72,872	8,704	127,959

3.11. L-8 Basin

No direct identification of L-8 Basin runoff is available from the SFWMM simulation results. It is necessary to estimate that runoff indirectly from the terms available in the simulation.

3.11.1. L-8 Borrow Canal Inflows

The 2006 ECP simulation includes the following inflows to the L-8 Borrow Canal:

- BKMCL8 (backflow from M-Canal to L-8 if M-Canal is sufficiently high; = 0 in the 2006 ECP simulation);
- CORBT1 (outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal, first outlet);
- CORBT2 (outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal, second outlet);
- DPRESO (outflow for flood control purposes from Dupuis Reserve into the L-8 Canal);
- L8CP (discharge from Lake Okeechobee to maintain L-8 canal);
- RESL80 (emergency overflow from Indian Trails reservoir to L-8 canal; = 0 in the 2006 ECP simulation);
- RESTL8 (flood control releases from reservoir in Indian Trails Water Control District into L-8 Canal);
- S352L8 (discharge from Lake Okeechobee via S352 into L-8 canal);
- WSL8S (water supply discharges from WCA-1 to L-8/M-canal).

Annual summaries of simulated inflows to the L-8 Borrow Canal are presented in Table 3.14.

Table 3.14 Simulated Inflows to L-8 Borrow Canal

Water Year	Simulated Inflow to L-8 Borrow Canal in Acre-Feet							
	CORBT1	CORBT2	DPRESO	L8CP	RESTL8	S352L8	WSL8S	Total Inflow
1966	29,220	17,774	7,115	22,439	16,728	17,710	1,736	112,722
1967	32,801	19,952	10,741	21,629	31,986	7,112	147	124,368
1968	13,909	8,460	6,714	9,405	18,074	44,591	6,524	107,677
1969	38,933	23,682	13,957	25,773	52,409	3,043	470	158,267
1970	39,417	23,976	13,811	36,288	31,502	0	0	144,994
1971	22,817	13,879	5,306	16,512	16,866	19,073	20	94,474
1972	25,837	15,716	4,735	17,500	16,115	29,452	1,450	110,805
1973	18,035	10,970	6,146	13,398	15,831	40,033	2,098	106,511
1974	22,323	13,578	5,638	15,321	17,547	25,597	1,838	101,841
1975	26,450	16,089	6,494	16,303	25,356	14,842	658	106,193
1976	22,005	13,385	6,929	13,360	17,051	46,584	2,074	121,389
1977	19,944	12,131	5,502	11,713	16,276	41,514	1,403	108,484
1978	26,478	16,106	7,847	21,534	14,061	15,054	2,918	103,998
1979	54,987	33,447	11,157	33,129	54,459	2,477	819	190,473
1980	13,151	7,999	6,441	10,220	15,824	42	0	53,676
1981	8,960	5,450	3,937	7,081	3,064	23,272	235	52,000
1982	12,395	7,540	6,544	12,184	27,339	7,320	5,003	78,325
1983	55,254	33,610	15,604	34,581	60,199	2,613	3,032	204,893
1984	43,954	26,736	15,338	23,735	47,403	0	0	157,167
1985	28,965	17,618	7,803	19,481	20,812	1,412	15	96,105
1986	20,958	12,748	8,928	11,455	21,441	20,234	3,951	99,714
1987	27,117	16,494	7,411	15,931	19,829	9,740	2,025	98,548
1988	18,142	11,035	6,609	12,519	16,690	19,611	4,229	88,835
1989	14,520	8,832	7,079	10,546	15,388	19,415	394	76,174
1990	14,439	8,783	2,559	6,679	8,957	13,259	5,349	60,026
1991	33,494	20,373	8,293	20,975	30,180	22,376	521	136,213
1992	35,778	21,763	6,994	27,623	28,291	186	0	120,633
1993	58,910	35,833	13,915	38,577	59,050	7,316	5,270	218,871
1994	41,936	25,508	4,741	16,650	33,344	0	0	122,179
1995	66,301	40,329	18,743	39,082	66,696	0	0	231,151
1996	34,266	20,843	12,547	19,745	34,220	0	44	121,665
1997	19,740	12,007	9,841	7,701	28,940	974	0	79,203
1998	48,030	29,215	10,594	20,030	47,505	0	0	155,374
1999	23,653	14,388	8,027	12,020	26,247	125	0	84,460
2000	18,999	11,556	11,642	12,380	27,496	3,982	292	86,347
Max. Annual	66,301	40,329	18,743	39,082	66,696	46,584	6,524	231,151
Min. Annual	8,960	5,450	2,559	6,679	3,064	0	0	52,000
Ave. Annual	29,489	17,937	8,734	18,671	28,091	13,113	1,500	117,536

3.11.2. L-8 Borrow Canal Outflows

The 2006 ECP simulation includes the following outflows from the L-8 Borrow Canal:

- BFLTL8 (backflow to Lake Okeechobee via L-8 for water supply purposes; = 0 in the 2006 ECP simulation);
- C10ABK (backflow from L-8 canal to Lake Okeechobee);

- L8C51W (flood control discharges from L-8 into C-51W);
- S2TMCL (flow from L-8 to M-canal via pump);
- S5A3SO (outflow from L-8 canal) – in the simulation results, this term is identical on a daily basis to L8C51W, and is excluded from this summary.

Annual summaries of simulated outflows from the L-8 Borrow Canal are presented in Table 3.15.

Table 3.15 Simulated Outflows from L-8 Borrow Canal

Water Year	Simulated Outflow from L-8 Borrow Canal in Acre-Feet			
	C10ABK	L8C51W	S2TMCL	Total Outflow
1966	44,447	42,562	93,589	180,677
1967	51,984	106,886	75,028	233,897
1968	48,122	754	112,255	161,220
1969	47,497	168,232	76,303	292,032
1970	44,324	138,520	49,520	232,364
1971	164	66,581	112,170	179,041
1972	57,653	18,830	101,760	178,242
1973	86,833	3,939	61,950	152,723
1974	77,583	0	79,925	157,508
1975	45,872	51,932	93,853	191,657
1976	73,863	4,876	108,955	187,696
1977	68,007	0	99,913	167,921
1978	89,213	0	84,250	173,462
1979	45,634	185,499	80,814	311,999
1980	159	41,864	102,979	145,002
1981	2,542	13,087	113,575	129,204
1982	108,800	0	28,671	137,471
1983	68,768	178,431	37,867	285,066
1984	57,319	129,395	61,501	248,215
1985	1,210	88,662	91,750	181,622
1986	57,981	8,249	90,418	156,648
1987	77,083	8,633	84,290	170,007
1988	30,630	34,981	102,230	167,841
1989	32,424	46,416	103,975	182,815
1990	68,606	0	41,895	110,501
1991	139,909	223	52,893	193,026
1992	65,585	51,523	82,009	199,118
1993	38,982	254,036	59,436	352,454
1994	29,664	71,670	106,754	208,087
1995	77,096	265,064	57,480	399,641
1996	31,418	165,109	88,829	285,355
1997	2,666	70,180	69,653	142,499
1998	50,109	119,824	57,404	227,337
1999	5,291	88,690	85,358	179,339
2000	19,262	78,807	81,024	179,093
Max. Annual	139,909	265,064	113,575	399,641
Min. Annual	159	0	28,671	110,501
Ave. Annual	49,906	71,527	80,865	202,308

3.11.3. Net Runoff from L-8 Basin

The simulated inflows to the L-8 Borrow Canal listed in Table 3.14 include the following terms representing discharge from areas included in the L-8 Basin:

- CORBT1 (outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal, first outlet);
- CORBT2 (outflow for flood control purposes from Corbett Area within L-8 basin to L-8 canal, second outlet);
- DPRESO (outflow for flood control purposes from Dupuis Reserve into the L-8 Canal);
- RESL80 (emergency overflow from Indian Trails reservoir to L-8 canal; = 0 in the 2006 ECP simulation);
- RESTL8 (flood control releases from reservoir in Indian Trails Water Control District into L-8 Canal).

The net runoff from the L-8 Basin is computed as:

> Total outflow (Table 3.15) – Total inflow (Table 3.14) + (CORBT1 + CORBT2 + DPRESO + RESL80 + RESTL8).

The final five terms in that formula are for this discussion defined as “Direct” in Table 3.16, which summarizes estimated annual runoff from the L-8 Basin.

Table 3.16 Estimated Annual Runoff from L-8 Basin

Water Year	Simulated Basin Runoff in Acre-Feet			
	L-8 Borrow Canal Outflow (Table 3.15)	L-8 Borrow Canal Inflow (Table 3.14)	"Direct" (see text)	Net Basin Runoff
1966	180,677	112,722	70,837	138,792
1967	233,897	124,368	95,480	205,009
1968	161,220	107,677	47,157	100,700
1969	292,032	158,267	128,980	262,745
1970	232,364	144,994	108,706	196,076
1971	179,041	94,474	58,869	143,436
1972	178,242	110,805	62,402	129,840
1973	152,723	106,511	50,982	97,194
1974	157,508	101,841	59,086	114,753
1975	191,657	106,193	74,389	159,853
1976	187,696	121,389	59,370	125,678
1977	167,921	108,484	53,854	113,291
1978	173,462	103,998	64,493	133,957
1979	311,999	190,473	154,049	275,575
1980	145,002	53,676	43,415	134,740
1981	129,204	52,000	21,412	98,616
1982	137,471	78,325	53,818	112,964
1983	285,066	204,893	164,668	244,840
1984	248,215	157,167	133,432	224,480
1985	181,622	96,105	75,197	160,714
1986	156,648	99,714	64,075	121,009
1987	170,007	98,548	70,852	142,311
1988	167,841	88,835	52,475	131,482
1989	182,815	76,174	45,819	152,460
1990	110,501	60,026	34,738	85,213
1991	193,026	136,213	92,340	149,153
1992	199,118	120,633	92,825	171,310
1993	352,454	218,871	167,708	301,291
1994	208,087	122,179	105,529	191,437
1995	399,641	231,151	192,069	360,560
1996	285,355	121,665	101,876	265,566
1997	142,499	79,203	70,528	133,824
1998	227,337	155,374	135,344	207,307
1999	179,339	84,460	72,315	167,194
2000	179,093	86,347	69,693	162,439
Max. Annual	399,641	231,151	192,069	360,560
Min. Annual	110,501	52,000	21,412	85,213
Ave. Annual	202,308	117,536	84,251	169,023

4. COMPARISON OF SIMULATED BASIN RUNOFF TO PREVIOUS ESTIMATES

The 2006 ECP SFWMM simulation results summarized in Part 3 were compared to previous estimates; an evaluation of the reasonableness of the simulation results is presented in Part 6. Previous estimates against which those results were compared include the October 2003 *Everglades Protection Area Tributary Basins, Long-Term Plan for Achieving Water Quality Goals* (the Long-Term Plan), and a March 2005 Draft *Supplemental Analysis* prepared for the Everglades Agricultural Area Environmental Protection District by Burns & McDonnell (the Supplemental Analysis).

The values shown for the "Long-Term Plan" are actually taken from an October 2002 *Evaluation of Alternatives for the ECP Basins*, prepared for SFWMD by Burns & McDonnell, for hydrologic conditions expected to exist in the period 2004-2006. Those values resulted from analysis of 31 years of SFWMM simulated data (calendar years 1965-1995). They would not reflect any influence of the conversion of lands to use in expanded STA-2 and STA-5.

The values shown for the "Supplemental Analysis" resulted from analysis of 10 years of record data that had been adjusted in an attempt to reflect the influence of changed land use and basin conditions (primarily for the conversion of lands to use in stormwater treatment areas) during that period. They do not reflect any influence of the conversion of lands to use in expanded STA-2 and STA-5. In addition, the Lake release volumes for that case do not reflect the influence of system management changes (such as elimination of Lake Okeechobee regulatory releases to the West Palm Beach Canal) already instituted by the SFWMD.

4.1. Chapter 298 Districts

On an average annual basis, the 2006 ECP simulation resulted in an estimated total runoff volume from the five Chapter 298 districts of 57,968 acre-feet per year, of which an average of 21,400 acre-feet per year (37% of the total) would be directed south, and an average of 36,568 acre-feet per year would be directed to Lake Okeechobee.

The original design of the Everglades Construction Project was developed on the assumption that approximately 80% of the total discharge from those districts would be diverted from Lake Okeechobee and directed south (some part of those diverted discharges would then have been sent to the Lake when Pump Stations S-2 and S-3 were operating).

In the Supplemental Analysis, it was noted that but two full years of data (Water Years 2003 and 2004) for the East Beach Water Control District and the combined discharges from the East Shore Water Control District and 715 Farms were available. Estimated average annual discharges from all five 298 districts were extrapolated from that limited information, and thus must be considered suspect.

A tabular comparison of the simulated average annual discharges from the 298 districts to those from earlier estimates is presented in Table 4.1. The data in that comparison is for estimated volumes directed south to the STAs.

Table 4.1 Comparison of Estimated Discharges from 298 Districts

298 District	Estimated Average Annual Discharge to STAs in Acre-Feet		
	From 2006 ECP Sim.	From Long-Term Plan	From Supp. Analysis
East Beach WCD	2,294	Not listed	21,528*
East Shore WCD & 715 Farms	5,220	9,247	30,897*
South Shore DD	3,534	3,569	13,959**
S-236 Basin (SFCD)	10,352	10,138	32,258**
TOTAL	**21,400**	**22,954**	**98,642**

* Based on two years data
** No data available

Both the recent simulation and the estimates from the Long-Term Plan vary widely from those in the Supplemental Analysis. However, the values in the Supplemental Analysis were highly extrapolated from the limited data available. Nonetheless, that data (limited to but two water years in three of the five 298 districts; runoff volumes from the SSDD and SFCD were assigned to result in an equal depth of runoff as that measured in the other three districts) resulted in roughly 240% of the estimated average annual data for all five districts from the simulations. It is unclear that any definitive conclusions can be drawn from the above, other

than that there is a need for substantial additional data to finalize the estimated contributions from the 298 districts to the STAs.

4.2. S-2/S-6/S-7 Basin

The following sections present comparisons of the simulated runoff from the S-2/S-6/S-7 Basin to those included in earlier estimates.

4.2.1. S-2/S-6 Basin Runoff to STA-2

The following is a comparison of the estimated average annual S-2/S-6 Basin runoff discharged to STA-2 resulting from the 2006 ECP SFWMM to earlier estimates:

- From the 2006 ECP simulation, an average of 198,717 acre-feet per year over Water Years 1966-2000;
- From the Long-Term Plan, an average of 180,007 acre-feet per year over calendar years 1965-1995;
- From the draft Supplemental Analysis, an (adjusted) average of 262,902 acre-feet per year over Water Years 1995-2004.

Simulations on which the Long-Term Plan was based were prepared assuming that the runoff from the basin would be reduced by 20% as a result of the implementation of Best Management Practices (BMPs). Dividing the Long-Term Plan estimate by 0.80 would yield an average annual value of 225,009 acre-feet per year, intermediate to the other two estimates. The estimate in the 2006 ECP simulation is 75.6% of that from the draft Supplemental Analysis.

A comparison of the total estimated basin runoff discharged to the south for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.2.

Table 4.2 Comparison of S-2/S-6 Basin Runoff to South, W.Y. 1995-2000

Water Year	Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	277,172	500,512	-44.6%
1996	198,930	343,943	-42.2%
1997	154,254	234,289	-34.2%
1998	206,387	314,148	-34.3%
1999	133,363	178,781	-25.4%
2000	211,287	285,801	-26.1%
Max. Annual	277,172	500,512	---
Min. Annual	133,363	178,781	---
Ave. Annual	196,899	309,579	-36.4%

4.2.2. S-2/S-7 Basin Runoff to South

The following is a comparison of the estimated average annual S-2/S-7 Basin runoff directed south (e.g., potential inflows to STA-3/4) resulting from the 2006 ECP SFWMM to earlier estimates:

- From the 2006 ECP simulation, an average of 253,942 acre-feet per year over Water Years 1966-2000;
- From the Long-Term Plan, an average of 212,611 acre-feet per year over calendar years 1965-1995;
- From the draft Supplemental Analysis, an (adjusted) average of 170,206 acre-feet per year over Water Years 1995-2004.

Simulations on which the Long-Term Plan was based were prepared assuming that the runoff from the basin would be reduced by 20% as a result of the implementation of Best Management Practices (BMPs). Dividing the Long-Term Plan estimate by 0.80 would yield an average annual value of 265,764 acre-feet per year, higher than the other two estimates but within 5% of the 2006 ECP simulation. The estimate from the 2006 ECP simulation exceeds that from the draft Supplemental Analysis by approximately 49.2%.

A comparison of the total estimated basin runoff discharged to the south for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.3.

Table 4.3 Comparison of S-2/S-7 Basin Runoff to South, W.Y. 1995-2000

Water Year	Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	352,268	284,888	23.7%
1996	241,285	186,004	29.7%
1997	207,859	164,632	26.3%
1998	280,929	179,556	56.5%
1999	169,484	127,840	32.6%
2000	260,955	217,746	19.8%
Max. Annual	352,268	284,888	---
Min. Annual	169,484	127,840	---
Ave. Annual	252,130	193,444	30.3%

4.2.3. Basin Runoff Back Pumped at S-2

No information on back pumping to Lake Okeechobee at S-2 is available from the Long-Term Plan. A comparison of the total estimated basin runoff discharged to the Lake for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.4.

Table 4.4 Comparison of Back Pumping at S-2, W.Y. 1995-2000

Water Year	Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	92,210	62,170	48.3%
1996	81,035	47,138	71.9%
1997	2,579	5,728	-55.0%
1998	7,131	11,158	-36.1%
1999	65,029	46,332	40.4%
2000	63,903	39,039	63.7%
Max. Annual	92,210	62,170	---
Min. Annual	2,579	5,728	---
Ave. Annual	51,981	35,261	47.4%

4.2.4. Total Basin Runoff

A comparison of the total estimated S-2/S-6/S-7 Basin runoff taken from the 2006 ECP simulation to that from the draft Supplemental Analysis for Water Years 1995-2000 (the common period of analysis) is presented in Table 4.5.

Table 4.5 Comparison of Total S-2/S-6/S-6 Basin Runoff, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	721,650	847,570	-14.9%
1996	521,250	577,085	-9.7%
1997	364,692	404,649	-9.9%
1998	494,446	504,862	-2.1%
1999	367,876	352,953	4.2%
2000	536,145	542,586	-1.2%
Max. Annual	721,650	847,570	---
Min. Annual	364,692	352,953	---
Ave. Annual	501,010	538,284	-6.9%

4.3. S-3/S-8 Basin

The following is a comparison of the estimated average annual S-3/S-8 Basin runoff discharged to STA-3/4 resulting from the 2006 ECP SFWMM to earlier estimates:

- From the 2006 ECP simulation, an average of 231,081 acre-feet per year over Water Years 1966-2000;
- From the Long-Term Plan, an average of 187,579 acre-feet per year over calendar years 1965-1995;
- From the draft Supplemental Analysis, an (adjusted) average of 248,346 acre-feet per year over Water Years 1995-2004.

Simulations on which the Long-Term Plan was based were prepared assuming that the runoff from the basin would be reduced by 20% as a result of the implementation of Best Management Practices (BMPs). Dividing the Long-Term Plan estimate by 0.80 would yield

an average annual value of 234,474 acre-feet per year, intermediate to the other two estimates. The estimate from the Supplemental Analysis exceeds that from the 2006 ECP simulation by approximately 7.5%.

A comparison of the total estimated basin runoff for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.6.

Table 4.6 Comparison of S-3/S-8 Basin Runoff, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	331,472	397,866	-16.7%
1996	292,059	306,679	-4.8%
1997	252,969	273,975	-7.7%
1998	286,155	384,032	-25.5%
1999	186,135	198,488	-6.2%
2000	306,542	313,480	-2.2%
Max. Annual	331,472	397,866	---
Min. Annual	186,135	198,488	---
Ave. Annual	275,889	312,420	-11.7%

The above tabulation includes all basin runoff, including that runoff delivered to Lake Okeechobee at S-3. In the 2006 ECP simulation, back pumping to the Lake over 1995-2000 averaged 9,944 acre-feet per year (3.6% of the total basin runoff). In the Supplemental Analysis, back pumping to the Lake over 1995-2000 averaged 12,401 acre-feet per year (4.0% of the total basin runoff). Over the common six years of analysis, the 2006 ECP simulation understates basin runoff (as compared to the Supplemental Analysis) by an average of 13.2%; roughly the same proportion of total basin runoff is back pumped to Lake Okeechobee in the two analyses.

The above values from the Supplemental Analysis reflect the removal of the 11,000-acre Southern Division Ranch Unit 2 from the S-3/S-8 Basin, and also reflect the impact of conversion of basin lands to use in the existing STA-5. The future expansion of STA-5 would not be expected to impact those values, as the expansion is situated in the historic Unit 2.

4.4. S-5A Basin

The following is a comparison of the estimated average annual S-5A Basin runoff resulting from the 2006 ECP SFWMM to earlier estimates:

- From the 2006 ECP simulation, the average annual total runoff from the S-5A Basin over Water Years 1966-2000 is estimated to be 296,411 acre-feet per year (including discharges delivered to STA-1E, STA-1W and STA-2);
- From the Long-Term Plan, an average of 205,054 acre-feet per year over calendar years 1965-1995, distributed as 139,891 acre-feet per year to STA-1W, 22,552 acre-feet per year to STA-1E, and 42,611 acre-feet per year to STA-2;
- From the draft Supplemental Analysis, an (adjusted) average of 261,642 acre-feet per year over Water Years 1995-2004.

Simulations on which the Long-Term Plan was based were prepared assuming that the runoff from the basin would be reduced by 20% as a result of the implementation of Best Management Practices (BMPs). Dividing the Long-Term Plan estimate by 0.80 would yield an average annual value of 256,318 acre-feet per year. The estimate from the 2006 ECP simulation exceeds that from the Supplemental Analysis by approximately 13.3%.

A comparison of the total estimated basin runoff for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.7.

Table 4.7 Comparison of S-5A Basin Runoff, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	472,263	428,633	10.2%
1996	321,247	288,043	11.5%
1997	254,909	222,917	14.4%
1998	320,207	298,564	7.2%
1999	236,109	180,078	31.1%
2000	276,093	286,415	-3.6%
Max. Annual	472,263	428,633	10.2%
Min. Annual	236,109	180,078	31.1%
Ave. Annual	313,471	284,108	10.3%

4.5. Total Runoff from EAA Basins

The following is a comparison of the estimated average annual runoff discharged to the various stormwater treatment areas resulting from the 2006 ECP SFWMM to earlier estimates for the EAA basins as a whole:

- From the 2006 ECP simulation, an average of 979,065 acre-feet per year over Water Years 1966-2000;
- From the Long-Term Plan, an average of 785,251 acre-feet per year over calendar years 1965-1995;
- From the draft Supplemental Analysis, an (adjusted) average of 943,096 acre-feet per year over Water Years 1995-2004 (excludes runoff from USSC SDR Unit 2).

The above totals exclude basin runoff back pumped to Lake Okeechobee at S-2 and S-3. Simulations on which the Long-Term Plan was based were prepared assuming that the runoff from the basin would be reduced by 20% as a result of the implementation of Best Management Practices (BMPs). Dividing the Long-Term Plan estimate by 0.80 would yield an average annual value of 981,564 acre-feet per year. The estimate from the 2006 ECP simulation exceeds that from the Supplemental Analysis by approximately 3.7%.

A comparison of the total estimated basin runoff for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the Supplemental Analysis) is presented in Table 4.8.

Table 4.8 Comparison of Total EAA Basin Runoff, W.Y. 1995-2000

Water Year	Total Estimated EAA Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	1,525,385	1,674,069	-8.9%
1996	1,134,556	1,171,807	-3.2%
1997	872,571	901,541	-3.2%
1998	1,100,808	1,187,458	-7.3%
1999	790,121	731,519	8.0%
2000	1,118,779	1,142,481	-2.1%
Max. Annual	1,525,385	1,674,069	---
Min. Annual	790,121	731,519	---
Ave. Annual	1,090,370	1,134,813	-3.9%

4.6. C-139 Basin

Runoff from the C-139 Basin is discharged at two principal locations, Structure G-136 (which discharges to the L-1E Canal in the S-3/S-8 Basin of the EAA) and to the L-3 Borrow Canal (at the current location of Structure G-406). Discharges at those two locations are considered separately.

4.6.1. Runoff Discharged at G-136

The following is a comparison of the estimated average annual runoff from the C-139 Basin discharged at G-136 taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 17,586 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 14,719 acre-feet per year over calendar years 1965-1995 (included only the term "G136SO" from the earlier simulation on which the estimates of the Long-Term Plan were based);

- From the draft Supplemental Analysis, an average of 17,797 acre-feet per year over water years 1995-2004.

A comparison of the total estimated discharge at G-136 for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.9.

Table 4.9 Comparison of C-139 Discharges at G-136, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	35,986	35,986	0.0%
1996	20,790	20,790	0.0%
1997	13,091	13,091	0.0%
1998	20,776	20,776	0.0%
1999	13,734	13,734	0.0%
2000	24,859	24,859	0.0%
Max. Annual	35,986	35,986	0.0%
Min. Annual	13,091	13,091	0.0%
Ave. Annual	21,540	21,539	0.0%

The two estimates are identical.

4.6.2. Runoff Discharged to L-3

The following is a comparison of the estimated average annual runoff from the C-139 Basin discharged to L-3 (and/or STA-5) taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 136,268 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 135,101 acre-feet per year over calendar years 1965-1995 (of that total, 3,065 acre-feet per year was considered to bypass STA-5 to STA-6, with the remainder being discharged to STA-5);

- From the draft Supplemental Analysis, an average of 170,154 acre-feet per year over water years 1995-2004.

A comparison of the total estimated discharge to L-3 for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.10.

Table 4.10 Comparison of C-139 Discharges to L-3, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	236,266	262,039	-9.8%
1996	214,969	266,251	-19.3%
1997	151,441	116,095	30.4%
1998	149,154	158,669	-6.0%
1999	122,057	106,210	14.9%
2000	168,780	156,794	7.6%
Max. Annual	236,266	266,251	-11.3%
Min. Annual	122,057	106,210	14.9%
Ave. Annual	173,778	177,676	-2.2%

While the average for the period for the two estimates compares reasonably well, substantial variations are evident in the annual estimates.

4.7. C-139 Annex

The following is a comparison of the estimated average annual runoff from the C-139 Annex discharged to STA-6 taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 11,986 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 11,944 acre-feet per year over calendar years 1965-1995);

- From the draft Supplemental Analysis, an average of 43,162 acre-feet per year over water years 1995-2004.

A comparison of the total estimated discharge from the C-139 Annex for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.11.

Table 4.11 Comparison of C-139 Annex Discharges, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	18,016	60,835	-70.4%
1996	19,710	53,721	-63.3%
1997	13,536	40,197	-66.3%
1998	11,080	46,083	-76.0%
1999	9,379	24,271	-61.4%
2000	15,579	46,364	-66.4%
Max. Annual	19,710	60,835	-67.6%
Min. Annual	9,379	24,271	-61.4%
Ave. Annual	14,550	45,245	-67.8%

C-139 Annex discharges input as a boundary condition to the SFWMM simulation are consistently well below the estimates of the draft Supplemental Analysis.

4.8. USSC SDR Unit 2

The following is a comparison of the estimated average annual runoff from the previous United States Sugar Corporation's Southern Division Ranch, Unit 2 taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 11,105 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 21,802 acre-feet per year over calendar years 1965-1995);

- From the draft Supplemental Analysis, an average of 49,989 acre-feet per year over water years 1998-2004.

A comparison of the total estimated discharge from Unit 2 of the USSC Southern Division Ranch for Water Years 1998-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.12.

Table 4.12 Comparison of USSC SDR Unit 2 Discharges, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1998	13,921	48,196	-71.1%
1999	7,555	40,119	-81.2%
2000	20,386	59,848	-65.9%
Max. Annual	20,386	59,848	-65.9%
Min. Annual	7,555	40,119	-81.2%
Ave. Annual	13,954	49,388	-71.7%

While the simulation results are substantially below those of the draft Supplemental Analysis, it should be recognized that, in the 2006 ECP simulation, it has been assumed that those lands will no longer be in agriculture and that water management (and drainage) would be substantially reduced from historic levels. A more complete evaluation is included in Part 6.

4.9. Acme Improvement District Basin B

The following is a comparison of the estimated average annual runoff from the Acme Improvement District Basin B taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 33,196 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 31,499 acre-feet per year over calendar years 1965-1995);

- From the draft Supplemental Analysis, an average of 33,724 acre-feet per year over water years 1995-2004.

A comparison of the total estimated discharge from the Acme Improvement District Basin B for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.13.

Table 4.13 Comparison of Acme Basin B Discharges, W.Y. 1995-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1995	40,554	54,947	-26.2%
1996	35,884	44,413	-19.2%
1997	35,219	30,080	17.1%
1998	40,946	47,292	-13.4%
1999	32,907	36,706	-10.4%
2000	43,424	38,400	13.1%
Max. Annual	43,424	54,947	-21.0%
Min. Annual	32,907	30,080	9.4%
Ave. Annual	38,156	41,973	-9.1%

A substantial variability between the two annual estimates is apparent; the simulated volumes tend to be significantly lower than those of the draft Supplemental Analysis.

4.10. C-51 West Basin

The following is a comparison of the estimated average annual runoff from the C-51 West Basin taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 127,959 acre-feet per year over water years 1966-2000;
- From the Long-Term Plan, an average of 105,202 acre-feet per year over calendar years 1965-1995);
- From the draft Supplemental Analysis, an average of 137,900 acre-feet per year over water years 1995-2004 (that average was based on data from slightly less than four

years, and would have included any inter-basin inflows from the Indian Trail Water Control District through the M-1 Canal at Royal Palm Beach).

There are but two full water years in the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis (Water Years 1999 and 2000). Partial data was available in Water Year 1998 (beginning July 24, 1997) for the draft Supplemental Analysis. A comparison of the total estimated discharge from the C-51 West Basin for Water Years 1998-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.14. The data from the draft Supplemental Analysis for Water Year 1998 is for a partial year.

Table 4.14 Comparison of C-51 West Basin Discharges, W.Y. 1998-2000

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Draft Supp. Analysis	Differential (%)
1998 (Partial)	151,587	162,096	-6.5%
1999	111,341	171,942	-35.2%
2000	165,270	111,561	48.1%
Max. Annual	165,270	171,942	-3.9%
Min. Annual	111,341	111,561	-0.2%
Ave. Annual	142,733	148,533	-3.9%

The limited data available for comparison suggests substantial variations from year to year, but relatively close agreement on average (again, the average is for slightly less than three years).

4.11. L-8 Basin

The following is a comparison of the estimated average annual runoff from the L-8 Basin taken from the 2006 ECP simulation to earlier estimates:

- From the 2006 ECP simulation, an average of 169,023 acre-feet per year over water years 1966-2000. Of that total, an average of 49,906 acre-feet per year is discharged to Lake Okeechobee at Culvert C-10A. The total simulated discharge to the south

from the L-8 Borrow Canal averages 71,527 acre-feet per year (considered in the simulation as delivered to the C-51 West Canal);

- The Long-Term Plan excludes any consideration of L-8 Basin runoff;
- From the draft Supplemental Analysis, an average of 197,389 acre-feet per year over water years 1995-2004, all delivered to the south. Of that total, an average of 150,325 acre-feet per year was considered delivered to the C-51 West Canal through S-5AE; an average of 32,876 acre-feet per year was considered delivered to the headwater of S-5A through S-5AW; and an average of 14,188 acre-feet per year was considered discharged through S-5AS.

A comparison of the total estimated discharge to the south (e.g., excludes discharge to Lake Okeechobee at Culvert C-10A) from the L-8 Basin for Water Years 1995-2000 (the common period of analysis between the 2006 ECP simulation and the draft Supplemental Analysis) is presented in Table 4.15.

Table 4.15 Comparison of L-8 Basin Discharges to South, W.Y. 1995-2000

Water Year	Estimated Basin Runoff to South in Acre-Feet					
	From 2006 ECP Simulation	From Draft Supplemental Analysis				Differential (%)
		At S-5AE	At S-5AW	At S-5AS	Total	
1995	265,064	230,235	82,222	54,850	367,307	-27.8%
1996	165,109	203,129	104,886	10,437	318,452	-48.2%
1997	70,180	76,696	19,691	0	96,387	-27.2%
1998	119,824	185,988	13,746	1,712	201,446	-40.5%
1999	88,690	112,789	14,065	13,040	139,894	-36.6%
2000	78,807	157,077	39,680	25,535	222,292	-64.5%
Max. Annual	265,064	230,235	104,886	54,850	367,307	---
Min. Annual	70,180	76,696	13,746	0	96,387	---
Ave. Annual	131,279	160,986	45,715	17,596	224,296	-41.5%

It is apparent that the simulated L-8 Basin discharge to the south in the 2006 ECP simulation is substantially less than that estimated in the draft Supplemental Analysis. A further discussion of discharges from this basin is included in Part 6.

5. SIMULATED LAKE OKEECHOBEE RELEASES

Lake Okeechobee releases in the 2006 ECP simulation considered in this analysis include all simulated releases at the following structures:

- Culvert C-10A (point of release from Lake Okeechobee to the L-8 Borrow Canal, at Sand Cut);
- Structure S-352 (point of release from Lake Okeechobee to the West Palm Beach Canal at Canal Point);
- Structure S-351 (point of release from Lake Okeechobee to the Hillsboro and North New River canals, adjacent to Pump Station S-2);
- Structure S-354 (point of release from Lake Okeechobee to the Miami Canal, adjacent to Pump Station S-3).

Lake releases at the above locations may be for any combination of the following purposes:

- Regulatory releases necessary to maintain Lake stages within regulation schedule;
- Water supply releases to the Everglades Agricultural Area for irrigation;
- Water supply releases intended for delivery to the urban areas of the Lower East Coast;
- Water supply releases intended to maintain the stormwater treatment areas in a hydrated condition;.
- Water supply releases intended to augment deliveries to the natural system.

The location and timing of Lake releases are far more subject to modification as a result of system management choices than is the case for basin runoff. As a result, there exists an increased potential for variations between the results of the 2006 ECP simulation and previous estimates. The manner in which those releases are accommodated in the downstream system (e.g., extent to which they are included as inflows to the various stormwater treatment areas) is subject to management choice as well.

5.1. Releases to Hillsboro and North New River Canals at S-351

In the 2006 ECP simulation, Lake Okeechobee releases to the Hillsboro and North New River Canals at Structure S-351 include the following terms:

- 351RG (Lake Okeechobee regulatory discharge via S351);
- 351WS (glades env releases + lec water supply met by Lake Okeechobee via S351);
- FLIMPH (import glades water met by Lake Okeechobee via Hillsboro Canal through S351; = 0 in 2006 ECP simulation);
- FLIMPN (import glades water met by Lake Okeechobee via North New River Canal through S351 (= 0 in 2006 ECP simulation);
- HLSBRG (Lake Okeechobee regulatory discharge via Hillsboro Canal; = 0 in 2006 ECP simulation);
- NNRCRG (Lake Okeechobee regulatory discharge via North New River canal);
- S150 (discharge from EAA_NNR/HLSB basin to conveyance canal CA3 in WCA-3A; = subset of 351WS, not basin runoff);
- S2 (total discharge from Lake Okeechobee to EAA_NNR/HLSB basin);
- S351 (total flow from Lake Okeechobee into EAA_NNRC/HLSB basin via S-351);
- S351PK (flow from Lake Okeechobee through S351 to help meet ENP flow targets);
- S6LCWS (water supply from Lake Okeechobee and EAA runoff to LEC that by-passes STA-2);
- WL1351 (water supply from Lake Okeechobee (thru S-351) to LEC SA2 via NNRC in the EAA);
- WL2351 (water supply from Lake Okeechobee (thru S-351) to LEC SA2 via Hillsboro Canal in the EAA);
- WL3351 (water supply from Lake Okeechobee (thru S-351) to LEC SA3 via NNRC thru S-150 in the EAA);
- WLC351 (water supply discharges to LEC from Lake Okeechobee via S-351);
- WSST2E (water supply discharge from Lake Okeechobee to eastern portion of STA-2);
- WSST2M (water supply discharge from Lake Okeechobee to middle portion of STA-2);
- WSST2W (water supply discharge from Lake Okeechobee to western portion of STA-2).

Review of the simulation results led to the following conclusions concerning certain of the above terms:

- The term "S2" represents net discharge from Lake Okeechobee (e.g., outflows at S-351 minus inflows at S-2), and is not further considered herein;
- Daily data for the term "S150" is identical to daily data for the term "WL3351" (e.g., a duplication), and is not further considered herein;
- The term "351RG" is the sum of the terms "NNRCRG" and "HLSBRG"; as, in the 2006 ECP simulation, "HILLSBRG" = 0, data for the term "351RG" is identical to data for the term "NNRCRG";
- Data for the term "WLC351" = WL1351 + WL2351 + WL3351 – S351PK;
- Data for the term "351WS" = WLC351 + WSST2E + WSST2M + WSST2W plus some part of the term "S6LCWS" (the term "S6LCWS" averages less than 500 acre-feet per year in the simulation).

Table 5.1 presents a summary of annual releases from Lake Okeechobee by purpose. That tabulation includes the apparent Everglades Agricultural Area irrigation release at S-351, which is computed as:

S351 - (WL1351+WL2351+WL3351+S351PK) – (WSST2E+WSST2M+WSST2W) – 351RG

EAA irrigation releases at the various discharge structures are not directly identified in the simulation results. The purpose in computing the apparent irrigation release at S-351 is to permit a subsequent check on the overall volume of Lake releases to the EAA.

The term "S6LCWS" is excluded from Table 5.1, as the proportion of that term representing Lake releases is uncertain. A minor error is introduced by that omission; the average annual volume for the term "S6LCWS" is less than 500 acre-feet per year.

Table 5.1 Simulated Lake Okeechobee Releases at S-351

Water Year	Simulated Releases from Lake Okeechobee to NNRC and Hillsboro at S-351									
	Total at S-351	Water Supply Release to Low WCA's				Water Supply to STA-2			Regulatory at S-351	EAA Irr. At S-351
		WL1351	WL2351	WL3351	S351PK	WSST2E	WSST2M	WSST2W		
1966	269,253	10,030	2,362	19,650	242	0	0	620	51,328	185,021
1967	268,265	256	0	0	0	0	0	0	109,043	158,967
1968	208,451	10,097	2,426	1,357	0	525	0	406	0	193,639
1969	245,378	1,491	0	0	0	0	0	0	163,163	80,724
1970	236,233	0	0	0	0	0	0	0	163,697	72,537
1971	328,446	19,834	7,806	14,766	0	0	0	0	63,011	223,030
1972	162,277	6,892	1,804	32,676	0	0	0	0	0	120,905
1973	108,284	1,526	0	4,688	0	0	0	0	0	102,070
1974	205,068	4,808	326	48,324	0	0	0	0	0	151,611
1975	223,779	11,800	23	9,441	0	0	0	0	35,538	166,977
1976	149,164	2,393	959	16,722	71	0	0	0	0	129,019
1977	143,170	4,580	0	169	0	0	0	0	0	138,421
1978	100,712	296	0	448	0	0	0	63	0	99,905
1979	174,962	0	0	0	0	0	0	0	90,585	84,377
1980	354,965	0	0	0	0	0	0	0	254,640	100,325
1981	199,768	7,120	0	3,055	72	0	0	0	15,453	174,068
1982	151,059	2,254	68	44,821	0	0	0	0	0	103,917
1983	172,913	0	0	0	0	0	0	0	82,568	90,344
1984	214,049	0	0	0	0	0	0	0	52,643	161,406
1985	259,157	8,357	0	8,514	107	0	0	0	32,380	209,799
1986	170,609	1,192	0	19,993	130	0	0	0	0	149,295
1987	136,627	0	0	0	0	0	0	0	33,640	102,987
1988	223,921	0	0	0	0	0	0	0	49,051	174,870
1989	236,111	5,718	0	46,561	0	0	0	0	0	183,832
1990	290,482	7,432	248	97,641	58	0	0	0	0	185,103
1991	103,093	369	69	14,358	0	0	0	0	0	88,297
1992	212,798	0	0	0	0	0	0	0	138,476	74,322
1993	295,987	0	33	0	0	0	0	0	153,477	142,476
1994	237,074	0	0	0	0	0	0	0	52,986	184,088
1995	141,824	0	0	0	0	0	0	0	57,560	84,264
1996	293,723	0	0	0	0	0	0	0	171,273	122,449
1997	219,064	0	0	0	0	0	0	0	84,256	134,808
1998	276,326	0	0	0	0	0	0	0	187,716	88,610
1999	299,176	1,142	0	0	0	0	0	0	80,706	217,328
2000	160,286	1,674	0	0	0	0	0	0	31,155	127,458
Max. Annual	354,965	19,834	7,806	97,641	242	525	0	620	254,640	223,030
Min. Annual	100,712	0	0	0	0	0	0	0	0	72,537
Ave. Annual	213,499	3,122	461	10,948	19	15	0	31	61,553	137,350

5.2. Releases to Miami Canal at S-354

In the 2006 ECP simulation, Lake Okeechobee releases to the Miami Canal at Structure S-354 include the following terms:

- 354RG (Lake Okeechobee regulatory discharge via S-354);
- 354WS (glades env releases + lec water supply met by Lake Okeechobee via S354);

- FLIMPM (import glades water met by Lake Okeechobee via Miami Canal thru S354);
- LKTROT (water supply from Lake Okeechobee via STA-5 to maintain appropriate schedule in Rotenberger Tract; = 0 in 2006 ECP simulation);
- LKTSEM (water supply from Lake Okeechobee to meet supplemental BCR Seminole demands);
- S3 (total discharge from Lake Okeechobee to EAA_MIAMI basin);
- S354 (total flow from Lake Okeechobee into EAA_MIAMI basin via S-354);
- S354PK (flow from Lake Okeechobee through S354 to help meet ENP flow targets);
- WLC354 (water supply discharges to LEC from Lake Okeechobee via S-354);
- WSHOLEY (water supply (environmental) releases from Lake Okeechobee to Holey Land)
- WSSTA3 (water supply (environmental) discharge from Lake Okeechobee to STA-3/4);
- WSSTA5 (water supply (environmental) discharge from Lake Okeechobee to STA-5);
- WSSTA6 (water supply (environmental) discharge from Lake Okeechobee to STA-6 via S-354 and Miami Canal).

Review of the simulation results led to the following conclusions concerning certain of the above terms:

- The term “S3” represents net discharge from Lake Okeechobee (e.g., outflows at S-354 minus inflows at S-3), and is not further considered herein;
- The term “S354PK” is not included in “WLC354”;
- Data for the term “354WS” closely approximates (within 30 acre-feet per year) the sum of FLIMPM + LKTSEM + S354PK + WLC354 + WSSTA3 + WSSTA5;
- Data for the term “WSSTA6” appears to not be included in the term “354WS”.

Table 5.2 presents a summary of annual releases from Lake Okeechobee by purpose. That tabulation includes the apparent Everglades Agricultural Area irrigation release at S-354, which is computed as:

S354 - (FLIMPM+LKTSEM+WLC354+WSHOLEY+S354PK) – (WSSTA3+WSSTA5) – 354RG

EAA irrigation releases at the various discharge structures are not directly identified in the simulation results. The purpose in computing the apparent irrigation release at S-354 is to permit a subsequent check on the overall volume of Lake releases to the EAA.

The term "WSSTA6" is excluded from Table 5.2.

Table 5.2 Simulated Lake Okeechobee Releases at S-354

Water Year	Simulated Releases from Lake Okeechobee to Miami Canal at S-354									
	Total at S-354	Water Supply Release to Low WCA's					STA Water Supply		Regulatory at S-354	EAA Irr. At S-354
		FLIMPM	LKTSEM	S354PK	WSHOLEY	WLC354	WSSTA3	WSSTA5		
1966	236,174	1,344	12,621	727	6,819	32,970	0	0	72,192	109,501
1967	248,788	0	18,715	0	0	0	0	0	133,854	96,219
1968	134,968	3,352	21,434	0	0	5,964	525	0	0	103,693
1969	270,348	0	4,234	0	0	0	0	0	206,377	59,737
1970	252,292	0	1,414	0	0	0	0	0	197,218	53,660
1971	282,588	0	28,984	0	0	24,657	0	0	87,291	141,654
1972	115,137	0	14,933	0	0	30,997	0	0	0	69,207
1973	103,460	2,508	21,633	0	0	6,234	0	0	0	73,085
1974	229,491	60	35,158	0	0	77,223	0	0	0	117,049
1975	225,681	0	24,962	0	0	51,713	0	0	39,576	109,429
1976	133,396	1,812	21,916	0	0	19,208	0	0	0	90,460
1977	106,706	0	24,485	0	0	511	0	0	0	81,711
1978	86,089	3,638	8,173	0	0	2,508	0	0	1,645	70,125
1979	178,242	0	6,952	0	0	0	0	0	113,325	57,965
1980	432,002	0	2,698	0	0	0	0	0	352,042	77,263
1981	194,187	0	28,699	134	0	5,485	0	0	26,749	133,120
1982	139,561	1,365	15,901	0	0	44,038	0	0	0	78,257
1983	170,147	1,523	6,742	373	0	740	0	0	98,042	62,727
1984	162,167	0	7,657	0	0	0	0	0	62,087	92,423
1985	197,919	238	26,536	0	0	7,711	0	0	45,141	118,292
1986	139,518	9,727	19,492	52	0	33,126	0	0	0	77,121
1987	152,560	0	13,528	0	0	0	0	0	42,855	96,177
1988	182,104	0	19,932	0	0	0	0	0	59,805	102,367
1989	220,243	2,213	33,367	0	0	48,765	0	0	0	135,897
1990	340,880	18,884	25,845	15,387	3,560	167,042	0	0	0	110,161
1991	138,911	9,087	21,311	3,338	0	33,571	0	0	0	71,604
1992	204,297	0	4,702	0	0	0	0	0	159,782	39,813
1993	279,161	0	8,349	0	0	0	0	0	182,750	88,062
1994	200,522	0	15,154	0	0	0	0	0	70,821	114,547
1995	131,677	0	4,510	0	0	0	0	0	62,769	64,398
1996	295,573	0	14,278	0	0	0	0	0	199,767	81,529
1997	201,814	0	15,162	0	0	0	0	0	103,557	83,094
1998	275,456	0	4,240	0	0	0	0	0	221,834	49,383
1999	246,544	0	18,226	0	0	0	0	0	92,986	135,332
2000	127,022	0	17,494	0	0	0	0	0	39,012	70,516
Max. Annual	432,002	18,884	35,158	15,387	6,819	167,042	525	0	352,042	141,654
Min. Annual	86,089	0	1,414	0	0	0	0	0	0	39,813
Ave. Annual	201,018	1,593	16,270	572	297	16,928	15	0	76,328	89,017

5.3. Releases to West Palm Beach Canal at S-352

In the 2006 ECP simulation, Lake Okeechobee releases to the West Palm Beach Canal at Structure S-352 include the following terms:

- 352RG (Lake Okeechobee regulatory discharge via S-352; = 0 in the 2006 ECP simulation);
- 352WS (glades env releases + lec water supply met by Lake Okeechobee via S-352);
- FLIMPW (import Glades water met by Lake Okeechobee via WPB canal thru S-352; = 0 in 2006 ECP simulation);
- S352 (total flow from Lake Okeechobee into EAA_WPB basin via S-352);
- S352L8 (discharge from Lake Okeechobee via S352 into L-8 canal);
- S5AWC1 (water supply from Lake Okeechobee that bypasses STA-1W to meet Lower East Coast demands);
- WLC352 (water supply discharges to LEC from Lake Okeechobee via S-352);
- WSST1W (water supply (environmental) discharge from Lake Okeechobee to STA-1W;
- WST1EE (water supply discharge from Lake Okeechobee to eastern portion of STA-1E);
- WST1EW (water supply discharge from Lake Okeechobee to western portion of STA-1E).

Review of the simulation results led to the following conclusions concerning certain of the above terms:

- The term “352WS” = WLC352 + WSST1W + WST1EE + WST1EW;
- The term “S5AWC1” is a subset of “WLC352”.

Table 5.3 presents a summary of annual releases from Lake Okeechobee by purpose. That tabulation includes the apparent Everglades Agricultural Area irrigation release at S-352, which is computed as:

S352 - (WLC352 + WSST1W + WST1EE + WST1EW) – S352L8

EAA irrigation releases at the various discharge structures are not directly identified in the simulation results. The purpose in computing the apparent irrigation release at S-352 is to permit a subsequent check on the overall volume of Lake releases to the EAA.

Table 5.3 Simulated Lake Okeechobee Releases at S-352

Water Year	Simulated Releases from Lake Okeechobee to West Palm Beach Canal at S-352						
	Total at S-352	Water Supply Releases					EAA Irr. At S-354
		WLC352	WSST1W	WST1EE	WST1EW	S352L8	
1966	127,956	11,270	0	209	50	17,710	98,717
1967	87,479	0	0	0	0	7,112	80,368
1968	181,588	9,058	0	0	0	44,591	127,938
1969	64,664	0	0	0	0	3,043	61,621
1970	47,164	0	0	0	0	0	47,164
1971	177,785	16,474	0	0	0	19,073	142,238
1972	114,763	3,384	0	0	163	29,452	81,764
1973	108,740	0	0	0	0	40,033	68,707
1974	128,283	1,594	0	0	0	25,597	101,091
1975	95,595	63	0	0	0	14,842	80,689
1976	130,805	2,052	0	0	0	46,584	82,169
1977	131,634	0	0	0	0	41,514	90,120
1978	85,107	0	0	0	0	15,054	70,053
1979	86,055	19,761	0	0	0	2,477	63,818
1980	69,398	613	0	0	0	42	68,743
1981	142,045	3,852	0	0	0	23,272	114,920
1982	72,285	202	0	0	0	7,320	64,763
1983	54,532	0	0	0	0	2,613	51,919
1984	88,091	3,028	0	0	0	0	85,064
1985	119,527	2,308	0	0	0	1,412	115,808
1986	119,228	0	0	0	0	20,234	98,994
1987	79,793	0	0	0	0	9,740	70,053
1988	136,192	0	0	0	0	19,611	116,581
1989	128,945	0	0	0	0	19,415	109,530
1990	117,035	1,009	0	0	0	13,259	102,768
1991	85,301	110	0	0	0	22,376	62,815
1992	57,231	2,457	0	0	0	186	54,588
1993	89,434	44	0	0	0	7,316	82,074
1994	98,846	4,572	0	0	0	0	94,274
1995	65,773	9,423	0	0	0	0	56,350
1996	94,351	3,676	0	0	0	0	90,676
1997	68,554	195	0	0	0	974	67,385
1998	47,493	0	0	0	0	0	47,493
1999	148,698	14,881	0	0	0	125	133,692
2000	125,538	16,751	0	0	0	3,982	104,806
Max. Annual	181,588	19,761	0	209	163	46,584	142,238
Min. Annual	47,164	0	0	0	0	0	47,164
Ave. Annual	102,169	3,622	0	6	6	13,113	85,421

5.4. Simulated Irrigation Supply to EAA

To verify that all Lake Okeechobee releases at S-351, S-352 and S-354 have been identified and accounted for in this evaluation of the 2006 ECP simulation, Everglades Agricultural Area irrigation releases were computed (as described above for releases at those three structures) as the difference between total release and releases identified as being for other purposes. The total irrigation release computed in that fashion was then compared to the term "WSEAA" in the simulation results, as shown in Table 5.4.

Table 5.4 Comparison of EAA Irrigation Release Volumes

Water Year	EAA Irrigation Supply from Lake Okeechobee				
	Indirect Estimates (Tables 5.1-5.3)				Total
	S-351	S-354	S-352	Total	WSEAA
1966	185,021	109,501	98,717	393,240	393,471
1967	158,967	96,219	80,368	335,553	335,553
1968	193,639	103,693	127,938	425,270	425,669
1969	80,724	59,737	61,621	202,081	202,081
1970	72,537	53,660	47,164	173,361	173,361
1971	223,030	141,654	142,238	506,922	506,922
1972	120,905	69,207	81,764	271,876	271,842
1973	102,070	73,085	68,707	243,862	243,862
1974	151,611	117,049	101,091	369,752	369,752
1975	166,977	109,429	80,689	357,095	357,095
1976	129,019	90,460	82,169	301,647	301,718
1977	138,421	81,711	90,120	310,252	310,252
1978	99,905	70,125	70,053	240,084	240,084
1979	84,377	57,965	63,818	206,160	206,160
1980	100,325	77,263	68,743	246,331	246,331
1981	174,068	133,120	114,920	422,109	422,181
1982	103,917	78,257	64,763	246,936	246,936
1983	90,344	62,727	51,919	204,991	204,991
1984	161,406	92,423	85,064	338,893	338,893
1985	209,799	118,292	115,808	443,899	444,006
1986	149,295	77,121	98,994	325,410	325,540
1987	102,987	96,177	70,053	269,217	269,217
1988	174,870	102,367	116,581	393,817	393,817
1989	183,832	135,897	109,530	429,259	429,259
1990	185,103	110,161	102,768	398,032	398,090
1991	88,297	71,604	62,815	222,716	222,716
1992	74,322	39,813	54,588	168,723	168,723
1993	142,476	88,062	82,074	312,612	312,612
1994	184,088	114,547	94,274	392,910	392,910
1995	84,264	64,398	56,350	205,012	205,012
1996	122,449	81,529	90,676	294,654	294,654
1997	134,808	83,094	67,385	285,287	285,287
1998	88,610	49,383	47,493	185,486	185,486
1999	217,328	135,332	133,692	486,351	486,351
2000	127,458	70,516	104,806	302,779	302,779
Max. Annual	223,030	141,654	142,238	506,922	506,922
Min. Annual	72,537	39,813	47,164	168,723	168,723
Ave. Annual	137,350	89,017	85,421	311,788	311,818

The close agreement of the simulated total EAA irrigation supply ("WSEAA") to the sum of irrigation supplies at S-351, S-352, and S-354 confirms that all simulated Lake releases at those structures have been identified and accounted for.

5.5. Releases to L-8 Borrow Canal at Culvert C-10A

In the 2006 ECP simulation, Lake Okeechobee releases to the L-8 Borrow Canal at Culvert C-10A are limited to the term L8CP (discharge from Lake Okeechobee to maintain L-8 canal). No regulatory releases from the Lake at Culvert C-10A are identified in the simulation. The data for the term "L8CP" averages 19,462 acre-feet per year over the period Water Years 1966-2000.

5.6. Comparison to Previous Estimates

As noted earlier, the location and timing of Lake Okeechobee releases are far more subject to modification as a result of system management choices than is the case for basin runoff. As a result, there exists an increased potential for variations between the results of the 2006 ECP simulation and previous estimates. The manner in which those releases are accommodated in the downstream system (e.g., extent to which they are included as inflows to the various stormwater treatment areas) is subject to management choice as well. As a result, comparison of the results of the 2006 ECP simulation to earlier estimates must recognize the influence of management choices.

Previous estimates against which the results of the 2006 ECP simulation were compared include the October 2003 *Everglades Protection Area Tributary Basins, Long-Term Plan for Achieving Water Quality Goals* (the Long-Term Plan), and a March 2005 Draft *Supplemental Analysis* prepared for the Everglades Agricultural Area Environmental Protection District by Burns & McDonnell (the Supplemental Analysis). The values shown for the "Long-Term Plan" are actually taken from an October 2002 *Evaluation of Alternatives for the ECP Basins*, prepared for SFWMD by Burns & McDonnell, for hydrologic conditions expected to exist in the period 2004-2006. Those values resulted from analysis of 31 years of SFWMM simulated data (calendar years 1965-1995). The values shown for the "Supplemental Analysis" resulted from analysis of 10 years of record data. The Lake release volumes for that case do not reflect the influence of system management changes (such as elimination of Lake Okeechobee regulatory releases to the West Palm

Beach Canal) already instituted by the SFWMD. In the analyses conducted for the Supplemental Analysis, no distinction was made in the ultimate destination of Lake Okeechobee releases for any purpose other than EAA irrigation. All such releases (both regulatory and water supply releases other than EAA irrigation) were termed as "Lake flow through" releases.

Table 5.5 summarizes all "Lake flow through" release volumes taken from the results of the 2006 EAA simulation.

At S-351, the average annual Lake flow through release taken from the results of the 2006 ECP simulation over water years 1966-2000 was 76,149 acre-feet per year. In the Long-Term Plan, the average annual Lake flow through release over calendar years 1965-1995 was estimated as 105,248 acre-feet per year (distributed as 1,609 acre-feet per year to STA-2, and 103,639 acre-feet per year to STA-3/4). In the Supplemental Analysis, the average annual Lake flow through release at S-351 was estimated as 85,746 acre-feet per year.

At S-354, the average annual Lake flow through release taken from the results of the 2006 ECP simulation over water years 1966-2000 was 112,001 acre-feet per year. In the Long-Term Plan, the average annual Lake flow through release over calendar years 1965-1995 was estimated as 128,087 acre-feet per year. In the Supplemental Analysis, the average annual Lake flow through release at S-354 was estimated as 40,326 acre-feet per year.

At S-352, the average annual Lake flow through release taken from the results of the 2006 ECP simulation over water years 1966-2000 was 16,747 acre-feet per year. In the Long-Term Plan, the average annual Lake flow through release over calendar years 1965-1995 was estimated as 21,074 acre-feet per year (distributed as 631 acre-feet per year to STA-1E, and 20,443 acre-feet per year to STA-3/4). In the Supplemental Analysis, the average annual Lake flow through release at S-352 was estimated as 101,855 acre-feet per year.

Table 5.5 Simulated Lake Okeechobee Flow Through Releases

Water Year	Lake Okeechobee Flow Through Releases			
	All Releases other than EAA Irrigation			
	S-351	S-354	S-352	Total
1966	84,232	126,672	29,239	240,143
1967	109,299	152,569	7,112	268,980
1968	14,812	31,275	53,649	99,736
1969	164,654	210,611	3,043	378,308
1970	163,697	198,632	0	362,329
1971	105,416	140,933	35,547	281,897
1972	41,373	45,930	32,998	120,301
1973	6,213	30,375	40,033	76,621
1974	53,457	112,441	27,192	193,090
1975	56,802	116,252	14,906	187,959
1976	20,146	42,936	48,636	111,718
1977	4,749	24,995	41,514	71,258
1978	806	15,964	15,054	31,824
1979	90,585	120,277	22,238	233,100
1980	254,640	354,740	655	610,035
1981	25,699	61,067	27,124	113,891
1982	47,142	61,304	7,523	115,969
1983	82,568	107,419	2,613	192,601
1984	52,643	69,744	3,028	125,414
1985	49,358	79,626	3,719	132,703
1986	21,314	62,397	20,234	103,945
1987	33,640	56,383	9,740	99,763
1988	49,051	79,737	19,611	148,400
1989	52,279	84,345	19,415	156,040
1990	105,378	230,718	14,268	350,365
1991	14,796	67,307	22,486	104,589
1992	138,476	164,484	2,643	305,603
1993	153,510	191,099	7,360	351,969
1994	52,986	85,974	4,572	143,532
1995	57,560	67,279	9,423	134,262
1996	171,273	214,045	3,676	388,994
1997	84,256	118,719	1,170	204,145
1998	187,716	226,073	0	413,789
1999	81,849	111,212	15,006	208,067
2000	32,828	56,506	20,733	110,067
Max. Annual	254,640	354,740	53,649	610,035
Min. Annual	806	15,964	0	31,824
Ave. Annual	76,149	112,001	16,747	204,897

6. EVALUATION

This section presents an evaluation of the results of the 2006 ECP simulation for reasonableness, including the results of the comparisons to earlier estimates included in Parts 4 and 5. To assist in the evaluation, an analysis of the simulated average annual depth of runoff from each of the basins tributary to the stormwater treatment areas of the ECP was prepared. Average annual runoff volumes from each basin were taken from Part 3. The basin areas were computed given the presence of all existing stormwater treatment areas as complete; STA-2 expanded by approximately 2,000 acres (with the expansion in the S-2/S-7 Basin); STA-5 expanded by approximately 2,110 acres (with the expansion in USSC SDR, Unit 2); and STA-6 expanded by 1,420 acres (with the expansion in USSC SDR, Unit 2). A summary of that analysis is presented in Table 6.1.

Table 6.1 Simulated Average Annual Basin Runoff, WY 1966-2000

Basin	Basin Area (acres)	Average Annual Runoff	
		Volume (acre-feet/year)	Depth (feet/yr)
EAA Basins			
S-2/S-6	119,900	219,994	1.83
S-2/S-7	117,660	275,219	2.34
S-3/S-8	117,420	238,629	2.03
S-5A	120,240	294,147	2.45
Subtotal	**475,220**	**1,027,989**	**2.16**
C-51 West	44,400	127,959	2.88
C-139	168,437	153,854	0.91
C-139 Annex	17,845	11,986	0.67
USSC SDR	6,470	11,105	1.72
Acme Basin B	8,680	33,196	3.82
L-8	109,600	169,023	1.54
Chapter 298 Districts			
EBWCD	6,542	11,388	1.74
ESWCD	8,136	14,404	1.77
715 Farms	3,398	6,000	1.77
SSDD	4,230	7,505	1.77
S-236	9,775	18,671	1.91
Subtotal	**32,081**	**57,968**	**1.81**
TOTAL	**862,733**	**1,593,080**	**1.85**

Table 6.1 includes all simulated basin runoff, without distinction as to point of discharge.

In Table 6.1:

- The area of the S-6/S-2 Basin was computed as the historic contributing area of 121,009 acres less approximately 1,100 acres converted to use in STA-2;
- The area of the S-7/S-2 Basin was computed as the historic contributing area of 142,160 acres less approximately 5,300 acres converted to use in the existing STA-2; 17,200 acres converted to use in the existing STA-3/4; and an additional 2,000 acres converted to use in the initial expansion of STA-2;
- S-2/S-6/S-7 Basin runoff back pumped to Lake Okeechobee at S-2 was distributed as 50% to the S-6/S-2 Basin and 50% to the S-7/S-2 Basin;
- The area of the S-5A Basin was computed as the historic contributing area of 126,910 acres less approximately 6,670 acres converted to use in STA-1W;
- The area of the S-3/S-8 Basin was computed as the historic contributing area of 133,642 acres less 4,220 acres converted to use in the existing STA-5 and 11,000 acres removed from the basin (USSC Southern Division Ranch, Unit 2) upon completion of STA-6 Section 1;
- The area of the C-51 West Basin was computed as the historic area of 51,000 acres less 6,600 acres converted to use in STA-1E;
- The area of the former USSC Southern Division Ranch Unit 2 was computed as 11,000 acres less a total of approximately 2,420 acres converted to use in STA-6 and an additional 2,110 acres converted to use in the initial expansion of STA-5.

6.1. Chapter 298 Districts

As noted in Part 4, both the 2006 ECP simulation results and the estimates from the Long-Term Plan vary widely from those in the Supplemental Analysis. However, the values in the Supplemental Analysis were highly extrapolated from the limited data available. Nonetheless, that data (limited to but two water years in three of the five 298 districts) resulted in roughly 240% of the estimated average annual data for all five districts from the simulations. It is unclear that any definitive conclusions can be drawn from the above, other than that there is a need for substantial additional data to finalize the estimated contributions from the 298 districts to the STAs.

Inspection of the simulation results summarized in Table 6.1 indicates that the simulated average annual depth of runoff from all the Chapter 298 districts combined is 1.81 feet, 0.35 feet per year less than the simulated average annual depth of runoff from the adjacent basins of the EAA (2.16 feet). The location of the Chapter 298 districts along the shore of Lake Okeechobee would lead to an expectation that the average depth of runoff from those areas should be higher than from the adjacent basins of the EAA due to the influence of seepage from the Lake.

Under Phase 2, Task 1.3 of SFWMD Contract CN040912-WO04, Burns & McDonnell prepared an analysis of all measured discharges from the various Chapter 298 districts over Water Years 1995-2004, using data furnished by the SFWMD. A summary of the resulting total discharges from the various districts is presented in Table 6.2.

Table 6.2 Recorded Chapter 298 District Discharges, W.Y. 1995-2004

Water Year	Total Discharge in Acre-Feet				
	EBWCD	ESWCD/715	SSDD	S-236	Total
1995	12,857	34,326	13,847	31,205	92,235
1996	11,269	31,269	10,848	27,733	81,119
1997	3,551	19,790	8,927	17,381	49,649
1998	10,040	26,377	9,499	19,539	65,455
1999	18,596	25,059	9,192	29,873	82,720
2000	29,283	45,171	14,877	43,096	132,427
2001	5,227	12,677	3,777	4,995	26,676
2002	18,023	21,685	5,354	17,710	62,772
2003	16,701	32,693	9,626	25,149	84,169
2004	19,353	30,281	7,632	23,786	81,052
Max. Annual	29,283	45,171	14,877	43,096	132,427
Min. Annual	3,551	12,677	3,777	4,995	26,676
Ave. Annual	14,490	27,933	9,358	24,047	75,827
Computation of Average Annual Runoff Depth					
Basin Area (ac)	6,542	11,534	4,230	9,775	32,081
Ave. Depth (ft)	2.21	2.42	2.21	2.46	2.36

Those depths of runoff would appear more consistent with the simulation results for the EAA as a whole, and would be considered preferable to the results of the simulation for runoff from the 298 districts. However, the following should also be noted:

- East Beach Water Control District: Some portion of the overall runoff from the EBWCD was discharged to the West Palm Beach Canal over water years 1995-2002 and not recorded, with the result that the average annual depth of runoff from this district shown in Table 6.2 may be understated. To the extent EBWCD runoff is understated for that reason, the annual runoff from the adjacent S-5A Basin would be overstated by the same amount.

It appears that the 2006 ECP simulation understates the total runoff from the Chapter 298 Districts by roughly 24%. Not all runoff from the Chapter 298 districts is expected to be delivered south to the STAs. The original 1994 Conceptual Design anticipated that roughly 80 percent of the runoff would be directed to the SFWMD canals in the EAA; the 2006 ECP simulation directs but 37% of the total runoff to the EAA canals.

Diversion facilities for the EBWCD and ESWCD/715 Farms were fully operable over Water Years 2003 and 2004. Data summarized under Phase 2, Task 1.3 indicates that, in those two years, just over 99% of the ESWCD/715 Farms runoff was discharged to the Hillsboro Canal; just under 98% of the EBWCD runoff was discharged to the West Palm Beach Canal. It would appear appropriate to anticipate that, with one possible exception, all runoff from the Chapter 298 districts will be directed to the primary canals of the EAA, and the expected volume of that runoff will be at least equal to the historic runoff volumes. That exception is the S-236 Basin, where, over Water Years 1995-2004, just under 44% of the total basin runoff was discharged to the Industrial Canal on the west side of the basin. It is not presently clear to what extent those discharges will be redirected to the Miami Canal.

6.2. EAA Basin Runoff

Comparative data summarized in Part 4 indicates that, for the EAA as a whole (e.g., sum of basins S-5A, S-2/S-6, S-2/S-7, and S-3/S-8), runoff volumes resulting from the 2006 ECP simulation are within roughly 4% of those developed in the Supplemental Analysis, both on an average annual basis for differing periods and on an average annual basis for the six common years of analysis, although more significant variations (up to 9%) are apparent from year-to-year. It would therefore appear reasonable to rely on the results of the 2006 ECP simulation for the overall volume of runoff from the EAA.

However, the data summarized in Part 4 reveals a lesser confidence in the comparability of simulated to recorded basin runoff for individual basins. That uncertain distribution is confirmed by analysis of the average annual depth of runoff from each basin presented in Table 6.1.

Average annual rainfall in the EAA generally increases from southwest to northeast, ranging from 49.8 inches per year near S-6 to 54 inches per year at S-5A (based on rainfall data at the various STAs included in the simulation and taken from an Excel file (ET_RF_STAs_ECP2006.xls) furnished by SFWMD). Also as reflected in the 2006 ECP simulation, average annual irrigation supplied over calendar years 1965-1995 in the various basins was as follows:

- In the S-5A Basin, 8.5 inches/year (average annual irrigation supply of 85,421 acre-feet, taken from Table 5.4, over a basin area of 120,240 acres);
- In the S-2/S-6/S-7 Basin, 4.8 inches/year (average annual irrigation supply of 137,350 acre-feet, taken from Table 5.4, over a combined basin area of 237,560 acres);
- In the S-3/S-8 Basin, 9.1 inches/year (average annual irrigation supply of 89,017 acre-feet, taken from Table 5.4, over a combined basin area of 117,420 acres).

It can be reasonably postulated that basin runoff should increase in rough proportion to the average annual supply (direct rainfall plus irrigation supply). The average annual depth of runoff from the EAA as a whole (1,027,989 acre-feet per year, from Table 6.1) is equivalent to roughly 43% of the total supply to the EAA (an average annual rainfall of roughly 52 inches per year over the 475,220-acre basin area, or 2,060,000 acre-feet, plus 311,800 acre-feet per year of irrigation supply).

6.2.1. S-5A Basin

Review of the comparative data summarized in Part 4 indicates that the results of the 2006 ECP simulation consistently exceed those of the draft Supplemental Analysis, averaging just more than 10% greater over the six common years of analysis, with more significant variations from year-to-year. The average annual depth of simulated runoff

(2.45 feet) is equal to roughly 47% of the total supply to the basin (8.5" irrigation plus an average rainfall of roughly 54"), exceeding the expected ratio by roughly 10%.

Table 6.3 compares the results of the 2006 ECP simulation to the more recent analysis prepared by Burns & McDonnell under Phase 2, Task 1.3 of this contract. The data in Table 6.3 was reduced from that of the Phase 2, Task 1.3 analysis by 2.5% in W.Y.1995-2000 to reflect the conversion of lands to use in an expansion of the original Everglades Nutrient Removal Project for STA-1W Cells 5A.

Table 6.3 Comparison of S-5A Basin Runoff

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Phase 2 Task 1.3	Differential (%)
1995	472,263	454,166	4.0%
1996	321,247	307,340	4.5%
1997	254,909	230,667	10.5%
1998	320,207	306,005	4.6%
1999	236,109	185,995	26.9%
2000	276,093	287,106	-3.8%
Max. Annual	472,263	454,166	---
Min. Annual	236,109	185,995	---
Ave. Annual	313,471	295,213	6.2%

It is concluded from the above that the results of the 2006 ECP simulation may slightly overstate, but can be considered to reasonably approximate, estimates of the actual runoff from the S-5A Basin.

It is noted that the simulation considers a part of the overall S-5A basin runoff to be diverted and directed to the Hillsboro Canal and STA-2 for treatment as a result of the S-5A Basin Diversion component of the 1994 Everglades Construction Project. That diversion (term "DIVERS") is estimated to average 59,342 acre-feet per year in the 2006 ECP simulation.

With the completion of Structure G-341, a total of 26,400 acres of the S-5A Basin will be diverted to the Hillsboro Canal. Upon the assumption that the diversion is entirely effective (e.g., no subsequent releases from that area east through G-341 to Pump Station S-5A), runoff from 22.0% of the total area of the S-5A Basin would be diverted. The results of the simulation indicate a diversion of 20.2% of the total average annual S-5A

Basin runoff. It is concluded that the estimated diversion of S-5A Basin runoff to the Hillsboro Canal in the 2006 ECP simulation is reasonably developed.

6.2.2. S-3/S-8 Basin

Review of the comparative data summarized in Part 4 indicates that the results of the 2006 ECP simulation are consistently below those of the draft Supplemental Analysis, averaging almost 12% less over the six common years of analysis, with more significant variations from year-to-year. The average annual depth of simulated runoff (2.03 feet) is equal to roughly 41% of the total supply to the basin (9.1" irrigation plus an average rainfall of roughly 51"), approximately 5% below the expected ratio.

Given the great number of adjustments necessary to estimate runoff in this basin from record data (as is evident from review of the Supplemental Analysis), the degree of confidence in the adjustments made in the Supplemental Analysis is relatively low.

On balance, it is concluded that the simulated runoff from the S-3/S-8 Basin may understate the actual by between 5 and 10%. The potential error in estimating overall inflows to STA-3/4 is expected to be between 12,000 and 24,000 acre-feet per year (between 2% and 5% of the total inflow).

6.2.3. S-2/S-6/S-7 Basin

The average annual runoff from the combined S-2/S-6/S-7 Basin taken from the 2006 ECP simulation for water years 1966-2000 is 494,127 acre-feet per year. The (adjusted) average annual runoff from the draft Supplemental Analysis for water years 1995-2004 is 478,572 acre-feet per year, roughly 3% below that in the simulation. For the common period of analysis (Water Years 1995-2000), comparative data presented in Part 4 suggests that the simulated total runoff from the combined basin falls below that of the draft Supplemental Analysis by an average of just under 7%. On balance, it is not evident that any significant adjustment to the results of the simulation would be necessary for this basin as a whole. However, the distribution of that runoff to the various points of discharge varies dramatically between the simulation and that developed in the Supplemental Analysis.

No immediate explanation is available for the significant difference in average annual depth of runoff between the S-2/S-6 and S-2/S-7 basins suggested in Table 6.1 (1.83 and 2.34 feet per year, respectively). Were the estimates of the draft Supplemental Analysis used instead, that differential would change direction (2.38 feet per year in the S-2/S-6 Basin, and 1.61 feet per year in the S-2/S-7 Basin).

It is probable that the distribution of runoff between the two sub-basins falls between that indicated in the 2006 ECP simulation and that indicated in the draft Supplemental Analysis. One possible explanation for the variation reported in the draft Supplemental Analysis is the probability that Pump Station S-6 was preferentially operated, given the presence of an operating stormwater treatment area (STA-2), essentially drawing water from the S-2/S-7 Basin.

The estimated average depth of runoff over the entire S-2/S-6/S-7 Basin from the draft Supplemental Analysis is 2.00 feet over Water Years 1995-2004. Upon the assumption of a uniform rate of removal from the entire basin, it would have been necessary for S-6 to "pull" an average of approximately 46,000 acre-feet per year from the S-2/S-7 Basin (equivalent to a mean transfer rate of 64 cfs), which appears plausible but would require further analysis to verify.

On balance, it would appear necessary to modify the results of the 2006 ECP simulation to shift approximately 29,900 acre-feet per year (10.9% of the total) of S-2/S-7 basin runoff to the S-2/S-6 basin.

Finally, the proportion of basin runoff back pumped at S-2 varies between the two estimates. On an average annual basis, the simulated average annual backpumping at S-2 over Water Years 1966-2000 (42,554 acre-feet per year) compares reasonably well to that estimated in the Supplemental Analysis for Water Years 1995-2004 (45,464 acre-feet per year). However, annual variations are extreme, with the ratio of simulated to estimated actual pumping at S-2 ranging from -55% to +72% over Water Years 1995-2000 (the common period of analysis).

6.3. C-139 Basin

As reported in Part 4, the total average annual runoff from the C-139 Basin (summation of discharges at G-136 and to the L-3 Borrow Canal and/or STA-5) taken from the results of

the 2006 ECP simulation for Water Years 1966-2000 is 153,854 acre-feet per year, equivalent to an average depth of runoff of 0.91 feet from the 168,437-acre basin. The total average annual runoff from the C-139 Basin taken from the draft Supplemental Analysis for Water Years 1995-2004 is 187,951 acre-feet per year (1.12 feet per year). That difference in average annual runoff, although for different periods, would appear significant.

For Water Years 1995-2000 (the common period of analysis between the two estimates), the average annual volumes of basin runoff taken from the two estimates are within 2%, although significant differences are noted from year-to-year at L-3/STA-5 (discharge estimates at G-136 are identical between the two estimates).

Data at both G-136 and L-3/STA-5 taken from the 2006 ECP simulation were input as boundary conditions to the SFWMM model. It appears there is perfect agreement between that input boundary condition at G-136 and the data employed in the draft Supplemental Analysis. The differences at L-3/STA-5 require further examination.

The data input as a boundary condition to the 2006 ECP simulation is based on data and methods summarized in a June 18, 2002 SFWMD memorandum from Luis Cadavid and Lehar Brion to Jayantha Obeysekera entitled *Western Boundary Flows at the L-1 and L-3 Canals for Simulation of the ECP Base (BASERR2R, SFWMM V3.8.2), ECP Future Base (2050wPROJ, SFWMM V4.4r6) and CERP Update (SFWMM V5.0).* It is possible that the underlying data has been adjusted or modified over the intervening three years.

Under Phase 2, Task 1.3 of SFWMD Contract CN040912-WO04, Burns & McDonnell prepared an analysis of all measured discharges from the C-139 Basin over Water Years 1995-2004, using data furnished by the SFWMD. Table 6.4 summarizes those estimates with the results of the 2006 ECP simulation and the draft Supplemental Analysis. The data presented in Table 6.4 excludes discharges from the C-139 Basin at Structure G-135, which enters the Flaghole Drainage District and is not directed to the EAA (discharges at G-135 were not considered in either the 2006 ECP simulation or in the draft Supplemental Analysis).

Table 6.4 C-139 Basin Runoff to L-3/STA-5

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Phase 2 Task 1.3 Analysis	From Draft Supp. Analysis
1995	236,266	262,326	262,039
1996	214,969	260,890	266,251
1997	151,441	151,440	116,095
1998	149,154	149,152	158,669
1999	122,057	122,058	106,210
2000	168,780	176,867	156,794
2001	N/A	53,198	52,883
2002	N/A	182,608	182,608
2003	N/A	209,085	209,274
2004	N/A	190,713	190,713
Max. Annual	236,266	262,326	266,251
Min. Annual	122,057	53,198	52,883
Ave. Annual	173,778	175,834	170,154

There is good agreement between the 2006 ECP simulation and the results of the Phase 2, Task 1.3 analysis in Water Years 1997- 2000 (a difference of 8,087 acre feet in Water Year 2000 results from apparent exclusion in the 2006 ECP simulation of discharges through the STA-5 inflow structures). Otherwise, it appears that significant differences remain in the estimates of runoff from the C-139 Basin to L-3/STA-5 between the various sources. As this is directly input data to the simulation, it is recommended that the differences be explained and resolved prior to use of the data in further analyses.

At L-3/STA-5, discharge data taken from the 2006 ECP simulation averages 153,269 acre-feet per year over Water Years 1966-1978; 113,257 acre-feet per year over Water Years 1979-1990; and 141,779 acre-feet per year over Water Years 1991-2000. Data taken from the draft Supplemental Analysis and the analysis under Phase 2, Task 1.3 of this contract averages 158,900 acre-feet per year at that same location.

Review and resolution of differing estimates of runoff from the C-139 Basin to L-3/STA-5 should consider not only the year-to-year differences in the estimates, but also the possible discrepancy as to average annual runoff volume between differing periods of analysis.

As noted earlier, the estimated discharges from the C-139 Basin at G-136 are identical between the three estimates considered herein. However, a difference does exist in the destination of those discharges. The draft Supplemental Analysis assigns the entire average annual discharge of 17,797 acre-feet per year as an inflow to STA-3/4. In the 2006 ECP simulation, an average of 13,203 acre-feet per year is included in the term "G136SO", representing an inflow to STA-3/4. The destination of the remaining 4,594 acre-feet per year (represented in the simulation by the term "G136EA") is unclear, and may be a combination of back pumping to Lake Okeechobee at Pump Station S-3, discharge from the Miami Canal at G-200, G-404 or S-357, or consumed in irrigation demand in the Miami Canal Basin. In any event, the limited volume involved suggests that subsequent analyses will not be significantly affected by the manner in which the term "G136EA" is considered.

6.4. C-139 Annex

Review of the comparative data for C-139 Annex discharges presented in Part 4 reveal a substantial variation between the estimates taken from the 2006 ECP simulation (average of 11,986 acre-feet per year over Water Years 1966-2000) and those taken from the draft Supplemental Analysis (average of 43,162 acre-feet per year over Water Years 1995-2004). From a basin having a total tributary area of 17,845 acres, those average annual runoff volumes are equivalent to average annual runoff depths of 0.67 feet and 2.42 feet, respectively.

This basin is developed almost entirely in citrus, although a part of the basin (generally along the L-3 Borrow Canal) is dedicated to water storage and management. It is probable that basin rainfall is supplemented by groundwater withdrawal for irrigation. The simulated average depth of runoff from the C-139 Annex appears unreasonably low. As for the C-139 Basin, runoff from the C-139 Annex is input as a boundary condition to the SFWMM. It is concluded that the input data for the C-139 Annex should not be employed in subsequent analyses without additional verification.

6.5. USSC SDR Unit 2

Average annual discharges from the historic United States Sugar Corporation's Southern Division Ranch, Unit 2 taken from the 2006 ECP simulation fall substantially below the recorded discharges at G-600 (11,105 acre-feet per year and 49,898 acre-feet per year,

respectively). Some part of that differential can be explained by a reduction in the basin area associated with expansion of STA-5 and the construction of STA-6 Section 2. In addition, the cessation of farming on those lands (which is believed to be reflected in the simulation) would result in an elimination of irrigation supply, which could be expected to further reduce overall runoff volume. However, the magnitude of the differential cannot be explained by those two factors alone. In the 2006 ECP simulation, the average depth of runoff over Water Years 1998-2000 was estimated as 2.16 feet per year (6,470-acre tributary area); recorded discharges at G-600 over that same period result in an average depth of runoff of 4.94 feet (10,000-acre tributary area).

It is probable that the significant difference between the two estimates results primarily from the influence of seepage inflows to Unit 2, which is surrounded on all sides by higher water bodies (the Rotenberger Tract on the east, STA-6 on the south, the L-3 Borrow Canal on the west, and STA-5 on the north). Further analyses employing the results of the 2006 ECP simulation for this basin should consider the influence of seepage inflows around its perimeter.

6.6. Acme Improvement District Basin B

On the basis of average annual discharge volume, the results of the 2006 ECP simulation for Water Years 1966-2000 compare reasonably well with the draft Supplemental Analysis estimates for Water Years 1995-2000 (within 2%). Results in any given water year are much more variable, as indicated by review of the data presented in Table 4.12. Over the period Water Years 1995-2000 (the common period of analysis of the two estimates), the estimates of the 2006 ECP simulation are approximately 10% below those presented in the draft Supplemental Analysis.

It is probable that the results of the 2006 ECP simulation would be less than actual discharge volumes by an unknown amount, as the actual discharges from Basin B would include seepage from the Loxahatchee National Wildlife Refuge not directly considered in the SFWMM simulation. It would appear that the overall discharges from Acme Basin B as simulated in the SFWMM (term “ACMECU”) should be increased by roughly 9% to result in equivalency with recorded discharge data, although the impact on the overall inflows to STA-1E of any such adjustment would be nominal at most (roughly 1-2%).

6.7. C-51 West Basin

The comparative data summarized in Part 4 indicates relatively close agreement between the results of the 2006 ECP simulation and the draft Supplemental Analysis with respect to runoff from the C-51 West Basin. The average annual runoff of 127,959 acre-feet per year taken from the simulation results for Water Years 1966-2000 compares reasonably well to the average annual runoff of 137,900 acre-feet per year estimated in the draft Supplemental Analysis. Given the short period of record for actual discharges available for the Supplemental Analysis (less than four full years), and the probability that discharge estimates of the Supplemental Analysis included unmeasured inflows from the ITWCD via the M-1 Canal, that roughly 10,000 acre-feet per year differential appears within reason. However, direct comparison of the less than three years of common period of analysis indicates substantial variations year-to-year. The average annual depth of runoff of 2.88 feet from this basin (see Table 6.1) also appears reasonable, given the degree of urbanization of this watershed and that rainfall on this basin is greater than that over the EAA.

However, the distribution of that runoff between S-319 and S-361 as indicated in the results of the simulation appears suspect. The simulation includes the term "S1324P", which is meant to represent the discharge at S-361 of runoff from Sections 13 and 24 (that part of the historic C-51 West Basin lying south of the Rustic Ranches subdivision and west of Flying Cow Road). In the simulation results, the term "S1324P" averages 8,704 acre-feet per year, clearly an excessive depth (roughly seven feet per year) from the less than two square mile area tributary to S-361. In any subsequent analysis, it is suggested that inflows to STA-1E at S-361, if considered separately from those at S-319, be established as a fixed percentage of the overall C-51 West Basin runoff.

6.8. L-8 Basin

Review of the comparative data presented in Part 4 for the L-8 Basin reveals that a substantial difference exists between the results of the 2006 ECP simulation and the draft Supplemental Analysis. Simulated runoff to the S-5A complex over Water Years 1966-2000 averaged 71,527 acre-feet per year. In the draft Supplemental Analysis, the estimated contribution of L-8 Basin runoff to the S-5A complex averaged 197,389 acre-feet per year over Water Years 1995-2004. Over Water Years 1995-2000 (the common period of analysis

of the two estimates), the estimate of the draft Supplemental Analysis exceeds that of the 2006 ECP simulation by an average of 93,017 acre-feet per year. However, in preparation of the draft Supplemental Analysis, no data was available for assessing the various potential sources of discharges to the S-5A complex and through S-5AE.

Under Phase 2, Task 1.3 of SFWMD Contract CN040912-WO04, Burns & McDonnell prepared an analysis of all measured inflows to and releases from the L-8 Basin over Water Years 1995-2004, using data furnished by the SFWMD. Table 6.5 presents a summary of all releases from the L-8 Basin, in which the releases are distributed by the source of water, taken from the Phase 2, Task 1.3 analysis.

Table 6.5 Historic L-8 Basin Releases by Source, W.Y. 1995-2004

Point of Release	Estimated Average Annual Release in Acre-Feet by Source, WY 1995-2004						
	Lake Okeechobee at C-10A	Structure S-5AS	C-51 West Basin at S-5AE	M Canal at City of WPB Control 2	West Palm Beach Canal at S-5AW	L-8 Basin Runoff	Total Release
Culvert C-10A	0	4,166	7	0	0	54,826	58,999
WPB Conrol 2	22,549	4,907	719	0	92	13,039	41,306
S-5AW	1,043	3,231	47	0	0	23,872	28,194
S-5AS	1,444	0	0	0	0	13,669	15,113
S-5AE	34,623	49,581	0	0	0	66,266	150,471
Total Release	59,659	61,886	773	0	92	171,673	294,083

Table 6.6 compares, for total runoff from the L-8 Basin, the results of the 2006 ECP simulation to the more recent analysis prepared by Burns & McDonnell under Phase 2, Task 1.3 of this contract for Water Years 1995-2000 (the common period of analysis).

Table 6.6 Comparison of Total L-8 Basin Runoff

Water Year	Total Estimated Basin Runoff in Acre-Feet		
	From 2006 ECP Simulation	From Phase 2 Task 1.3 Analysis	Differential (%)
1995	360,560	330,857	9.0%
1996	265,566	217,311	22.2%
1997	133,824	114,722	16.7%
1998	207,307	215,860	-4.0%
1999	167,194	144,950	15.3%
2000	162,439	158,672	2.4%
Max. Annual	360,560	330,857	---
Min. Annual	133,824	114,722	---
Ave. Annual	216,148	197,062	9.7%

During those six water years, the simulation results somewhat exceed those resulting from the Phase 2, Task 1.3 analysis. On an average annual basis, the simulated average of 169,023 acre-feet per year over Water Years 1966-2000 compares well to the average of 171,673 acre-feet per year resulting from the Phase 2, Task 1.3 analysis of historic data over Water Years 1995-2004.

Of more direct interest to subsequent analysis is a comparison of the results of the 2006 ECP simulation to those of the Phase 2 Task 1.3 analysis for those basin discharges directed south to the S-5A complex, as it is those discharges that may need to be treated in the STAs. A comparison of those discharges is presented in Table 6.7.

Table 6.7 Comparison of L-8 Basin Runoff to S-5A Complex

Water Year	Basin Runoff to S-5A Complex in Acre-Feet		
	From 2006 ECP Simulation*	From Phase 2 Task 1.3 Analysis	Differential (%)
1995	265,064	238,957	10.9%
1996	165,109	177,663	-7.1%
1997	70,180	70,747	-0.8%
1998	119,824	111,752	7.2%
1999	88,690	71,262	24.5%
2000	78,807	118,215	-33.3%
Max. Annual	265,064	238,957	---
Min. Annual	70,180	70,747	---
Ave. Annual	131,279	131,433	-0.1%

* Limited to term L8C51W

While significant differences exist year-to-year, the average annual discharge over those six Water Years is almost identical between the two estimates.

Given the above, it is concluded that the results of the 2006 ECP simulation for L-8 Basin runoff reasonably approximates historic data for multi-year analyses, and should be suitable for use in subsequent analyses under this contract.

6.8.1. Lake Okeechobee Releases at Culvert C-10A

Based on the results of the Phase 2, Task 1.3 analyses, the average annual Lake Okeechobee release to the L-8 Borrow Canal at Culvert C-10A over Water Years 1995-2004 was 66,535 acre-feet per year. That total inflow was distributed as follows:

- To the C-51 West Canal at S-5AE: 34,623 acre-feet per year. It is unknown to what extent these discharges were either regulatory releases from the Lake or water supply to the C-51 West Basin and other basins adjacent to the C-51 Canal.
- To the south through Structure S-5AS: 1,444 acre-feet per year;
- To the West Palm Beach Canal at S-5AW: 1,043 acre-feet per year;
- To the M Canal at the City of West Palm Beach Control No. 2: 22,549 acre-feet per year;
- Approximately 6,876 acre-feet per year consumed for other water supply purposes in the L-8 Basin.

In the 2006 ECP simulation, the average annual Lake release at C-10A was limited to the term "L8CP", and averaged 18,671 acre-feet per year over Water Years 1966-2000. Other than the tem "L8C51W", discharges to the east at S-5A were limited to an average of 4,063 acre-feet per year, all of which passed through the C-51 West Basin to points east. It is unclear what part of that discharge originated at Culvert C-10A.

It is apparent from the above that the following management choices were made in the simulation:

- No regulatory releases from Lake Okeechobee were considered at C-10A;
- Water supply releases destined for the Lower East Coast Service Area No. 1, if made at C-10A, would not be significant and in any event should be excluded from inflows to STA-1E (as was done in the simulation).

Each of those choices can be reasonably made; it would obviously be necessary for the SFWMD's operating rules and protocols to reflect those management choices in future operations.

6.8.2. Releases to L-8 Borrow Canal at Structure S-5AS

Based on the results of the Phase 2, Task 1.3 analyses, the average annual release to the L-8 Borrow Canal at Structure S-5AS over Water Years 1995-2004 was 67,444 acre-feet per year. That total inflow was distributed as follows:

- To the C-51 West Canal at S-5AE: 49,582 acre-feet per year. It is unknown to what extent these discharges were either regulatory releases from the Loxahatchee National Wildlife Refuge, or water supply to the C-51 West Basin and other basins adjacent to the C-51 Canal (either from the Refuge or same-day pumping at Pump Station S-5A).
- To Lake Okeechobee at Culvert C-10A: 4,166 acre-feet per year;
- To the West Palm Beach Canal at S-5AW: 3,231 acre-feet per year;
- To the M Canal at the City of West Palm Beach Control No. 2: 4,908 acre-feet per year;
- Approximately 5,558 acre-feet per year consumed for other water supply purposes in the L-8 Basin.

In the 2006 ECP simulation, the average annual release at S-5AS was limited to the term "WSl8S", and averaged but 1,500 acre-feet per year over Water Years 1966-2000.

It is apparent from the above that the following management choices were made in the simulation:

- No regulatory releases from the Refuge were considered at S-5AS;
- Water supply releases destined for the Lower East Coast Service Area No. 1, if made at S-5AS, would not be significant and in any event should be excluded from inflows to STA-1E (as was done in the simulation).

Each of those choices can be reasonably made; it would obviously be necessary for the SFWMD's operating rules and protocols to reflect those management choices in future operations.

6.9. Lake Okeechobee Releases

The location and timing of Lake releases are far more subject to modification as a result of system management choices than is the case for basin runoff. As a result, there exists an increased potential for variations between the results of the 2006 ECP simulation and previous estimates. The manner in which those releases are accommodated in the downstream system (e.g., extent to which they are included as inflows to the various stormwater treatment areas) is subject to management choice as well. Substantial differences exist between the overall volume of Lake Okeechobee "flow through" releases in the 2006 ECP simulation and those of earlier estimates. Overall, the average annual volume of Lake flow-through releases taken from the results of the 2006 ECP simulation was estimated to be 204,897 acre-feet per year over Water Years 1966-2000. Data summarized in the draft Supplemental Analysis averaged 227,927 acre-feet per year over calendar years 1995-1995. The Long-Term Plan included an average annual Lake flow-through release of 254,409 acre-feet per year over calendar years 1965-1995.

Certain of those differences result from the management choices made in the simulation as compared to historic operation. Principal among those choices is the elimination of regulatory releases from the Lake at S-352 to the West Palm Beach Canal and delivery of regulatory releases to S-6 from S-351, coupled with a substantially increased volume of flow through releases to the Miami Canal at S-354. Those adjustments in release location are consistent with an observed need to reduce loading to STA-1W and STA-2, and are considered reasonable.

A potentially significant difference between the manner in which certain of the Lake releases are handled in the downstream system does exist between the 2006 ECP simulation and that considered in the draft Supplemental Analysis. In the draft Supplemental Analysis, all Lake Okeechobee flow-through releases are introduced to the STAs for treatment prior to delivery to the downstream system. The 2006 ECP simulation excludes certain water supply releases from the STA inflows. Those releases, which average 53,832 acre-feet per year in the simulation, typically occur only when there is a downstream water supply demand and the receiving Water Conservation Area is below its "floor" elevation, upon the basic assumption that such releases would remain within the conveyance canals and not impact the adjacent marshes. That assumption appears reasonable, but requires that the operating plans for the

STAs specifically define the physical conditions under which such bypass would be permitted, and an appropriate "accounting" mechanism is established in permit compliance monitoring and reporting procedures.

7. SUMMARY OF PRINCIPAL CONCLUSIONS

The following is a summary listing of principal conclusions reached in this evaluation of the results of the SFWMD's 2006 ECP simulation, particularly as compared to those reflected in the Long-Term Plan and summarized in the March 2005 (Draft) Supplemental Analysis:

1. Chapter 298 Districts (including the East Beach Water Control District, East Shore Water Control District, 715 Farms, South Shore Drainage District, and S-236 Basin): The 2006 ECP simulation (and the data considered in the Long-Term Plan) substantially underestimates the total runoff from these areas. In addition, the simulated distribution of that runoff (proportion delivered to either Lake Okeechobee or the primary canal system of the Everglades Agricultural Area) is inconsistent with both planning goals for the basin diversions and the limited data that exists for completed diversions.
2. EAA Basins (including the S-5A, S-2/S-6, S-2/S-7, and S-3/S-8 Basins): The 2006 ECP simulation appears to reasonably project total runoff from the entire Everglades Agricultural Area, when compared to the draft Supplemental Analysis. Both those estimates substantially exceed those considered in the Long-Term Plan. Those differences are attributed primarily to the anticipated reduction of 20% in basin runoff associated with implementation of Best Management Practices (BMPs) considered in development of the data reflected in the Long-Term Plan. In addition:
   - Simulated runoff from the S-5A Basin may slightly overstate basin runoff as compared to the estimates presented in the draft Supplemental Analysis, but are considered reasonable;
   - That simulated discharge from that part of the S-5A Basin being diverted to the Hillsboro Canal in connection with the S-5A Basin Diversion of the 1994 Everglades Construction Project correlates reasonably well to the estimates of the draft Supplemental Analysis;
   - Simulated runoff from the S-3/S-8 Basin may somewhat understate basin runoff as compared to the estimates presented in the draft Supplemental Analysis, but are considered reasonable;

- The simulated runoff from the combined S-2/S-6/S-7 Basin compares well with that of the draft Supplemental Analysis, but significant differences are apparent in the distribution of that runoff between the various basin outlets. At a minimum, adjustment to shift roughly 10% of the total discharges at S-7 and S-150 to S-6 should be considered in any future analyses.

3. C-139 Basin: Discharges from the C-139 Basin reflected in the results of the 2006 ECP simulation do not result from the simulation, but are input as a boundary condition.
   - There is little or no difference in the data for total discharges from this basin at G-136 between the 2006 ECP simulation and the draft Supplemental Analysis. Both those estimates exceed those reported for the Long-Term Plan, which are believed to have been limited to only that part of the total discharge at this structure considered to be directed to the south as inflow to STA-3/4. It may be reasonable to assume that not all the discharges at this structure would be introduced to STA-3/4, but the volume in question is not sufficient to materially influence any future analysis of STA-3/4.
   - There continues to be substantive differences in the data for discharges from this basin to the L-3 Borrow Canal and/or STA-5, both with respect to variances between the different estimates and apparent substantive changes in simulated runoff over different periods of the simulation. The data input to the simulation as a boundary condition at this location warrants substantial further review directed to the resolution of those differences prior to its use in further analysis.
4. C-139 Annex: Discharges from the C-139 Annex reflected in the results of the 2006 ECP simulation do not result from the simulation, but are input as a boundary condition. While the data taken from the 2006 ECP simulation compares reasonably well with that considered in the Long-Term Plan, both are substantially below the data summarized in the draft Supplement Analysis and would appear to represent unreasonably low depths of runoff from the basin. The data input to the simulation as a boundary condition at this location warrants substantial further review directed to the resolution of those differences prior to its use in further analysis.
5. USSC Southern Division Ranch Unit 2: Average annual discharges from the historic United States Sugar Corporation's Southern Division Ranch, Unit 2 taken from the 2006 ECP simulation fall substantially below the recorded discharges at G-600. Further

analyses employing the results of the 2006 ECP simulation for this basin should consider the influence of seepage inflows around its perimeter.

6. Acme Improvement District Basin B: The results of the 2006 ECP simulation for Water Years 1966-2000 compare reasonably well with the draft Supplemental Analysis estimates for Water Years 1995-2000 (within 2%). Upon comparison of common periods of analysis, it would appear that the overall simulated discharges from Acme Basin B should be increased by roughly 9% to result in equivalency with recorded discharge data, although the impact on the overall inflows to STA-1E of any such adjustment would be nominal at most (roughly 1-2%).
7. C-51 West Basin: The comparative data summarized in Part 4 indicates relatively close agreement between the results of the 2006 ECP simulation and the draft Supplemental Analysis with respect to average annual runoff from the C-51 West Basin, although substantive year-to-year variations exist in the limited common period of analysis. Simulated inflow volumes at S-361 appear unreasonably high; inflows to STA-1E at S-361, if considered separately from those at S-319, should be established as a fixed percentage of the overall C-51 West Basin runoff in lieu of utilizing the results of the simulation.
8. L-8 Basin: The results of the 2006 ECP simulation for L-8 Basin runoff reasonably approximates historic data for multi-year analyses, and should be suitable for use in subsequent analyses under this contract. Releases from the L-8 Canal originating in Lake Okeechobee (at Culvert C-10A) and in the STA-1 Inflow Basin and/or Loxahatchee National Wildlife Refuge (at Structure S-5AS) in the 2006 ECP simulation vary markedly from historic releases. Those variations apparently result from changes in management strategy. Each of those management choices can be reasonably made; it would obviously be necessary for the SFWMD's operating rules and protocols to reflect those management choices in future operations.
9. The volume and distribution of Lake Okeechobee flow-through releases in the 2006 ECP simulation appear reasonable, but will require the establishment of specific procedures in the operating plan for each STA governing bypass for downstream water supply, and establishment of appropriate "accounting" methods in monitoring and reporting protocols for permit compliance.

8. RECOMMENDATIONS FOR SUBSEQUENT ANALYSES

Based on the evaluations and principal conclusions presented earlier in this document, it is recommended that the development of inflow (volumetric) data sets for use in subsequent projections of water quality treatment performance in the various stormwater treatment areas, as well as of the potential redistribution of inflows for improved performance, for conditions expected to exist at the end of 2006 be based on the following. Wherever practicable, it is intended that a daily time series of inflows to the various STAs be developed encompassing Water Years 1966-2000.

1. Chapter 298 Districts (including the East Beach Water Control District, East Shore Water Control District, 715 Farms, South Shore Drainage District, and S-236 Basin): Runoff volumes from these basins should be based on historic data to the maximum extent practicable, as the 2006 ECP simulation does not well represent either the total discharges or distribution of discharges from these basins. Currently available record data on those discharges (summarized in the Task Report prepared under Phase 2, Task 1.3) encompasses Water Years 1995-2004. As a result, only Water Years 1995-2000 can be directly imported for the analysis. For Water Years 1966-1994, it will be necessary to estimate those inflow volumes by indirect methods. That indirect estimation will be made through an analysis of total daily runoff volumes from the various Chapter 298 Districts regressed against total daily runoff volumes from adjacent basins of the EAA, using historic data for Water Years 1995-2004. The relationships resulting from that regression analysis will then be applied to the daily simulated runoff from the adjacent EAA basins to develop a daily time series for runoff from the Chapter 298 Districts over Water Years 1966-1994. With one possible exception, it is further recommended that all runoff from these districts be included in the inflows to the STAs (e.g., assumption of 100% diversion efficiency). That possible exception is for discharges from the S-236 Basin to the Industrial Canal at Pump Station P-5-W; additional analysis would be necessary to confirm the reasonableness of an assumption of 100% diversion efficiency for that structure.
2. EAA Basins (including the S-5A, S-2/S-6, S-2/S-7, and S-3/S-8 Basins): With one adjustment, it is recommended that subsequent analyses employ the results of the 2006 ECP simulation over Water Years 1966-2000. That adjustment should address the need

for shifting approximately 11% of the basin runoff simulated as entering the North New River Canal to the Hillsboro Canal.

3. C-139 Basin: Different recommendations are made for discharges from this basin at G-136 and to the L-3 Borrow Canal:
   - Discharges at G-136: As this structure discharges to the EAA, it is considered necessary to include daily time series over Water Years 1966-2000 in the analysis. It is recommended that the boundary condition data for discharges at this structure be taken from the 2006 ECP simulation. It is further recommended that only those discharges from this structure associated with the term G136SO be considered as delivered to STA-3/4, as discharges for the term G136EA are typically consumed as water supply in the S-3/S-8 Basin.
   - Discharges to the L-3 Borrow Canal at the present location of G-406 (essentially, possible inflows to STA-5): For at least conditions expected to exist at the end of 2006, it is unlikely that the analysis of STA-5 will impact or be impacted by regional operations. Given the uncertainty associated with much of the period of boundary condition inflows reflected in the 2006 ECP simulation, particularly prior to Water Year 1995, it is recommended that subsequent analysis of this basin and STA-5 be based on historic data. It is further recommended that the analyses in the Phase 2, Task 1.3 report be updated to include actual discharges in Water Year 2005, resulting in an 11-year period of analysis. Further, given the ongoing efforts for development of additional Best Management Practices in this basin, it is recommended that historic phosphorus concentrations be reduced by 10% in subsequent analyses.
4. C-139 Annex: It is recommended that historic data for Water Years 1995-2004 at station USSO be used in lieu of the boundary conditions input to the 2006 ECP simulation for analysis of C-139 Annex discharges and STA-6. Given limitations on available data for the other primary source of inflow to STA-6 (USSC Southern Division Ranch, Unit 2, see following recommendation), it is probable that analysis of STA-6 for conditions expected to prevail at the end of 2006 will be limited to Water Years 1998-2004.
5. Former USSC Southern Division Ranch Unit 2: It is recommended that, following certain adjustments, historic discharge data at G-600 for Water Years 1998-2004 be used in lieu of simulated runoff from this basin for analysis of STA-6. It will be desirable to separate the historic data into two primary components. Those components are basin discharges resulting from rainfall, and basin discharges resulting from seepage into Unit 2 from

adjacent areas. Following that separation, each component would require further adjustment. Basin discharges resulting from runoff should be adjusted to reflect the conversion of approximately 20% of the basin to use in STA-5 and 15% of the basin to use in STA-6 (total adjustment of approximately -35% in historic discharges from rainfall). Basin discharges resulting from seepage should be adjusted to reflect the reduced perimeter of the basin resulting from the conversion of lands to use in STA-5.

6. Acme Improvement District Basin B: It is recommended that, following certain adjustments, daily runoff volumes from this basin resulting from the 2006 ECP simulation for Water Years 1966-2000 be employed in subsequent analyses. The simulation results do not reflect increased basin discharges resulting from seepage into the basin from the Loxahatchee National Wildlife Refuge. It is recommended that the simulated discharge volumes from Acme Basin B be increased by 9% prior to the conduct of subsequent analyses. In addition, management options to be considered in subsequent analyses may include the possibility of direct return of accumulated seepage from the LNWR back to the LNWR, in lieu of diverting those inflows to STA-1E for treatment. It will therefore be desirable to approximate the influence of such management on the volumes discharged from Acme Basin B to the C-51 West Canal and STA-1E. It is presently anticipated that those seepage inflows might account for between 15 and 20 percent of the total runoff from this basin.
7. C-51 West Basin: It is recommended that the results of the 2006 ECP simulation for <u>total</u> basin runoff over Water Years 1966-2000 be used in subsequent analyses. However, with respect to that part of the overall basin runoff discharged to STA-1E at Pump Station S-361, the simulation results (term S1324P in the simulation) are clearly unreasonable. For any analysis in which those inflows to STA-1E are considered separately from the basin as a whole, it is recommended that those inflows be established at a fixed percentage of the overall basin runoff. On the assumption of a uniform depth of runoff over the entire basin, that percentage would be approximately 2.5%.
8. L-8 Basin: It is recommended that the results of the 2006 ECP simulation be used for subsequent analysis of runoff from the L-8 Basin.
9. Lake Okeechobee Releases: It is recommended that the results of the 2006 ECP simulation for Lake releases directed to the stormwater treatment areas be employed in subsequent analyses. It will be necessary to confirm that the assumptions in the

simulation concerning water supply bypass of the STAs be reflected in the adopted operating plans for the STAs.

10. Inflows to STA-1E: The simulation is inconsistent with the SFWMD's current intent for the combined interim operation of S-319 and Structure S-155A. The simulation attempts to maximize that part of the total inflows to the C-51 West Canal directed to STA-1E, while the current operational intent is to bypass a volume at S-155A equivalent to the total inflow from the L-8 Basin (reference: letter dated May 24, 2005 from Chip Merriam, Deputy Executive Director of SFWMD, to Dennis Duke, P.E. of the Jacksonville District, U.S. Army Corps of Engineers). Full adjustment of inflows to STA-1E to reflect that change can be expected to directly impact other significant elements of the simulation (such as the potential need for additional Lake Okeechobee water supply releases to the LNWR to offset reductions in potential supply). For that reason, it is recommended that the 2006 ECP simulation be modified to properly reflect the full impact of L-8 Basin runoff and the SFWMD's interim operations plan prior to the conduct of subsequent analyses. Should that not be practicable, it will be necessary to adjust those inflows in some other fashion.
11. Distribution of Outflows from the STA-1 Inflow Basin (term L101 in the simulation): It will be necessary to confirm that the adopted operating plan for the various structures in the STA-1 Inflow Basin (S-5A, S-5AS, S-5AW, G-300, G-301, G-302, G-303 and G-311) are properly coordinated with and reflected in the SFWMM simulation, as the operation of those structures will directly impact inflows to both STA-1W and the westerly two flow paths of STA-1E.

While the above recommendations are specific to subsequent analyses to be conducted for conditions expected to exist at the end of 2006, it is anticipated that the resultant data sets for runoff from the following basins would also be directly applicable to analyses for 2010 and 2015 conditions:

- Chapter 298 districts;
- C-139 Basin;
- C-139 Annex;
- C-51 West Basin;
- Acme Improvement District Basin B.

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