

October 15, 2013

Governing Board, South Florida Water Management District

Dear Chairman O'Keefe and Governing Board Members:

Attached for consideration by the Governing Board is a set of suggestions designed to reduce the damaging discharges from Lake Okeechobee to the St. Lucie River and Estuary, the Indian River Lagoon and the coastal reefs. These suggestions would also provide benefits to the Caloosahatchee River and Estuary. These suggestions do not rely on Congressional authorization of additional projects – they can be implemented now. After listening to your discussion at last Thursday's Board meeting, I believe these are the type of recommendations you are seeking as part of a near-term alternative to federal projects.

By way of brief background, my name is Gary Goforth. I am a Ph.D. environmental engineer with more than 25 years of hands-on experience in the restoration and protection of the Kissimmee-Okeechobee-Everglades ecosystem. I was one of the lead environmental engineers with the South Florida Water Management District during the planning, design, permitting, construction and operation of the Everglades Stormwater Treatment Areas between 1988 and 2004. I have authored or co-authored technical chapters relating to STA performance in the annual South Florida Environmental Report every year since the inaugural 1998 *Interim Report*, continuing through the current report. I have testified many times as an expert witness on behalf of the District and State of Florida in the federal Everglades lawsuit. I wrote many of the STA operation plans used by the District. I left the District in January 2005 to start my own engineering firm based in Stuart, Florida, and the District is my primary client.

I drafted these suggestions for your consideration outside of all contractual relationships with the District and other organizations, and used publically available data. This set of suggestions is not a final engineering document as defined in Chapter 471, Florida Statutes and Chapter 61G15, Florida Administrative Code.

I look forward to discussing these and other suggestions with you and/or the full Governing Board at your convenience.

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## Specific Suggestions for Increasing Lake Regulatory Releases to the South

**Brief Background.** Emergency operations are underway to manage water levels in Lake Okeechobee to reduce the risk of failure of the Herbert Hoover Dike. This emergency condition necessitates discharge of environmentally and economically damaging releases from the Lake to the coastal estuaries, where county governments have declared states of emergency, and/or have asked the Governor to declare a state of emergency. During these emergency conditions, public health and safety issues surrounding Lake Okeechobee releases temporarily override other operational objectives throughout the region. Between January and September, almost 1.4 million acre feet of Lake releases<sup>1</sup> have been sent to the St. Lucie and Caloosahatchee estuaries, the largest volume of Lake releases sent to the estuaries since before the 2004-2005 hurricanes (**Figures 1 and 2**). In addition to freshwater, these releases have conveyed millions of pounds of nitrogen and hundreds of thousands of pounds of phosphorus to the estuaries. Between January and September, approximately 212,000 acre feet of Lake releases have been sent south through the Everglades Agricultural Area (EAA) and L-8 Canal basins to the Stormwater Treatment Areas (STAs), Water Conservation Areas (WCAs) and other downstream waters. Of that, approximately 75,000 acre feet of Lake releases have been sent through the STAs (**Figure 3**). Although available STA treatment area has increased dramatically – 15-fold since 1995 (3,815 acres in 1995 to 57,000 acres today) – the volume of Lake releases sent through the EAA to the STAs and WCAs has decreased significantly (**Figure 4**). In addition to the STAs, the District manages water on over 60,000 acres of public lands south of the Lake and north of the WCAs in the Holey Land and Rotenberger Wildlife Management Areas (WMA).

***Based on a review of recent and historical data, I suggest that the District consider sending significantly more Lake releases to the STAs and WMAs during this time of emergency conditions.*** Specific suggestions are provided below. Adverse impacts to these areas can be minimized by sending Lake releases to all these areas as opposed to just one or two of them. By way of example, if STA-1E, STA-1W, STA-2 and STA-3/4 each receive an average of three feet of Lake releases per month (e.g., 20,100 acre feet to the 6,700-acre STA-1W), and STA-5/6, Holey Land and Rotenberger each receive an average of 0.5 feet of per month, over 167,000 acre feet per month of Lake releases could be sent south. The District might also consider declaring a state of emergency to enable greater flexibility to send more water sent to south, e.g., to the WCAs and points further south, and to designate Lake regulatory releases as high of priority as flood control discharges.

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<sup>1</sup> Lake releases include regulatory releases and, in the case of the Caloosahatchee Estuary, deliveries made to maintain acceptable salinity ranges within the estuary. All estimates are preliminary and subject to revision.

FIGURE 1.

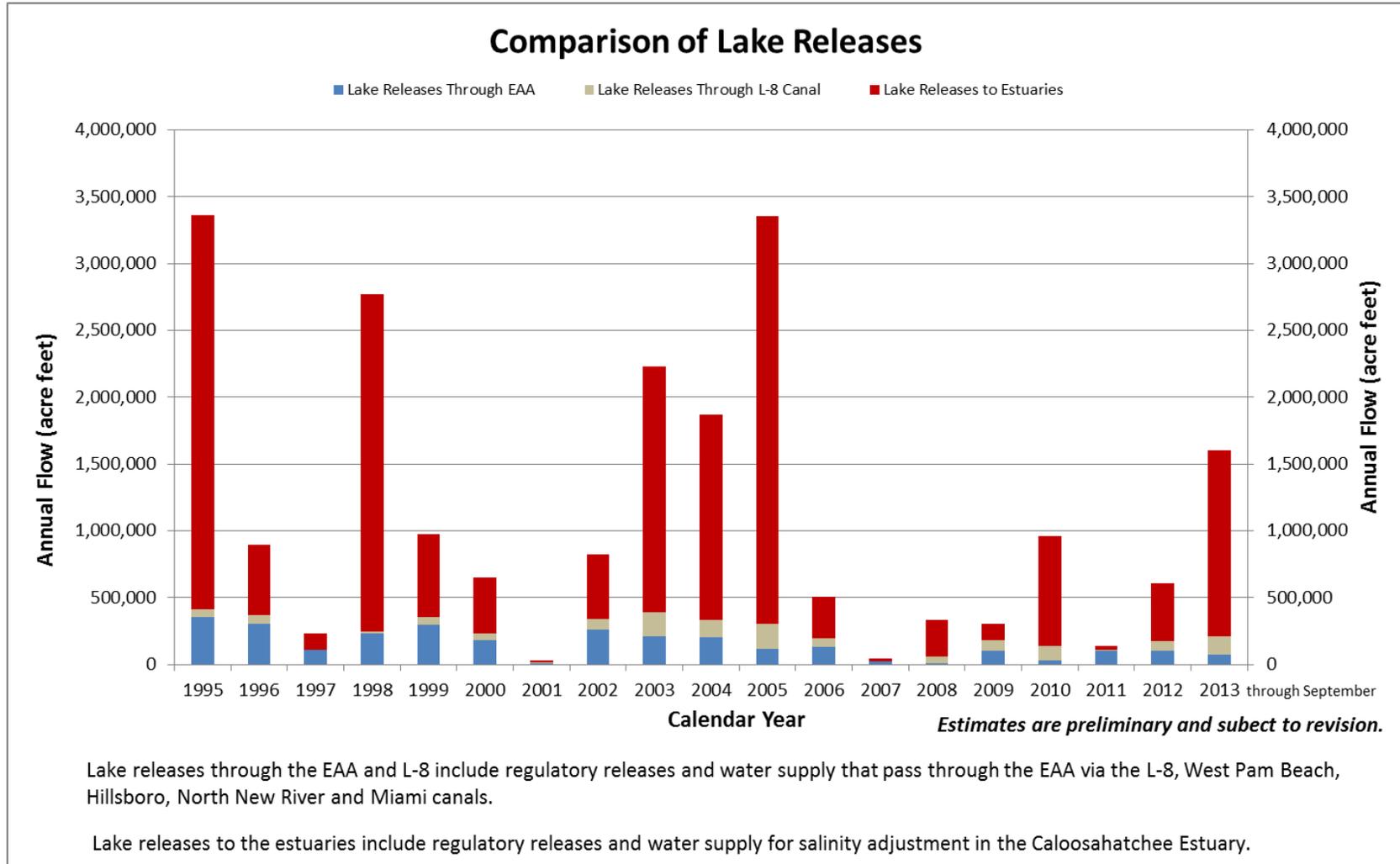
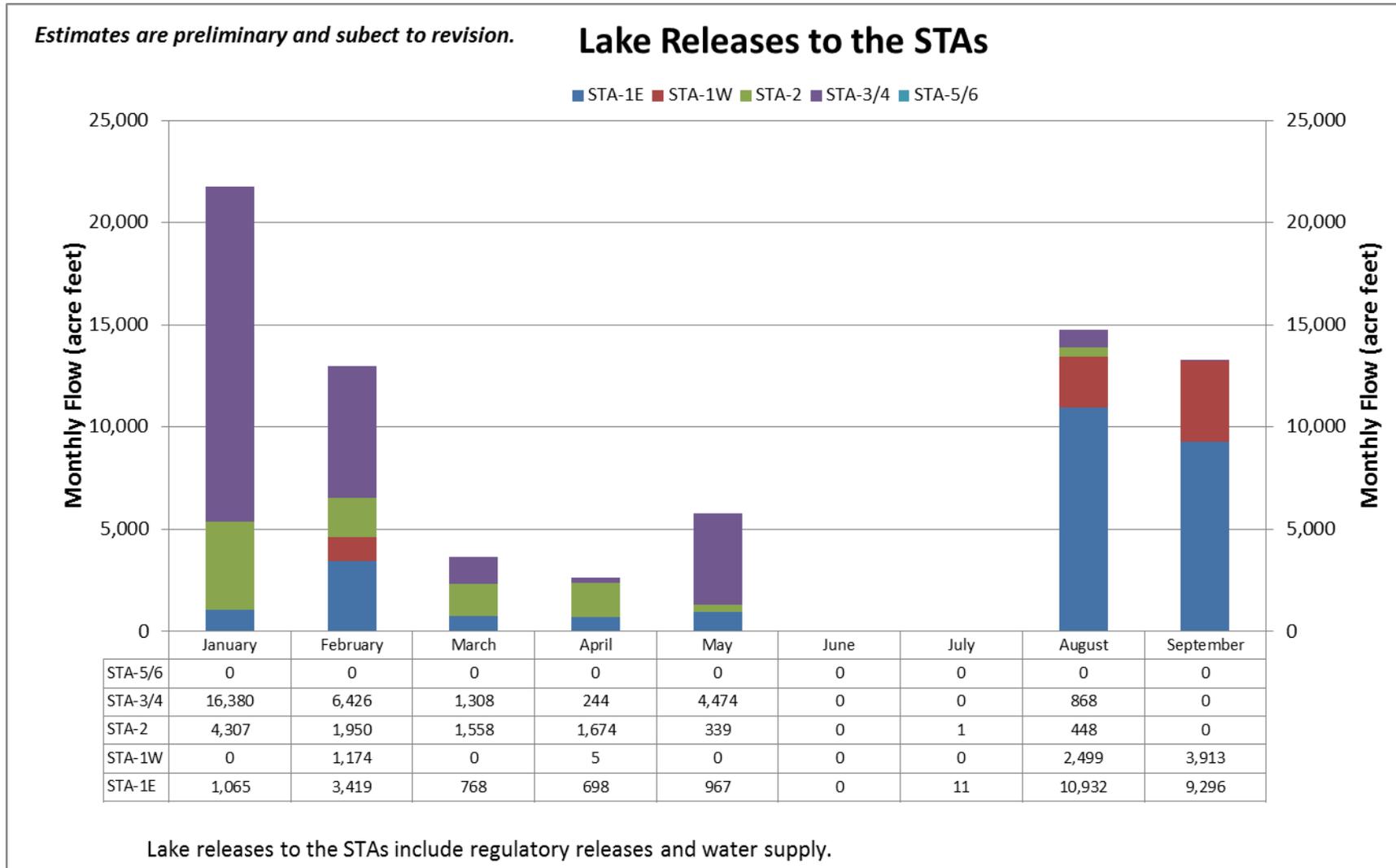
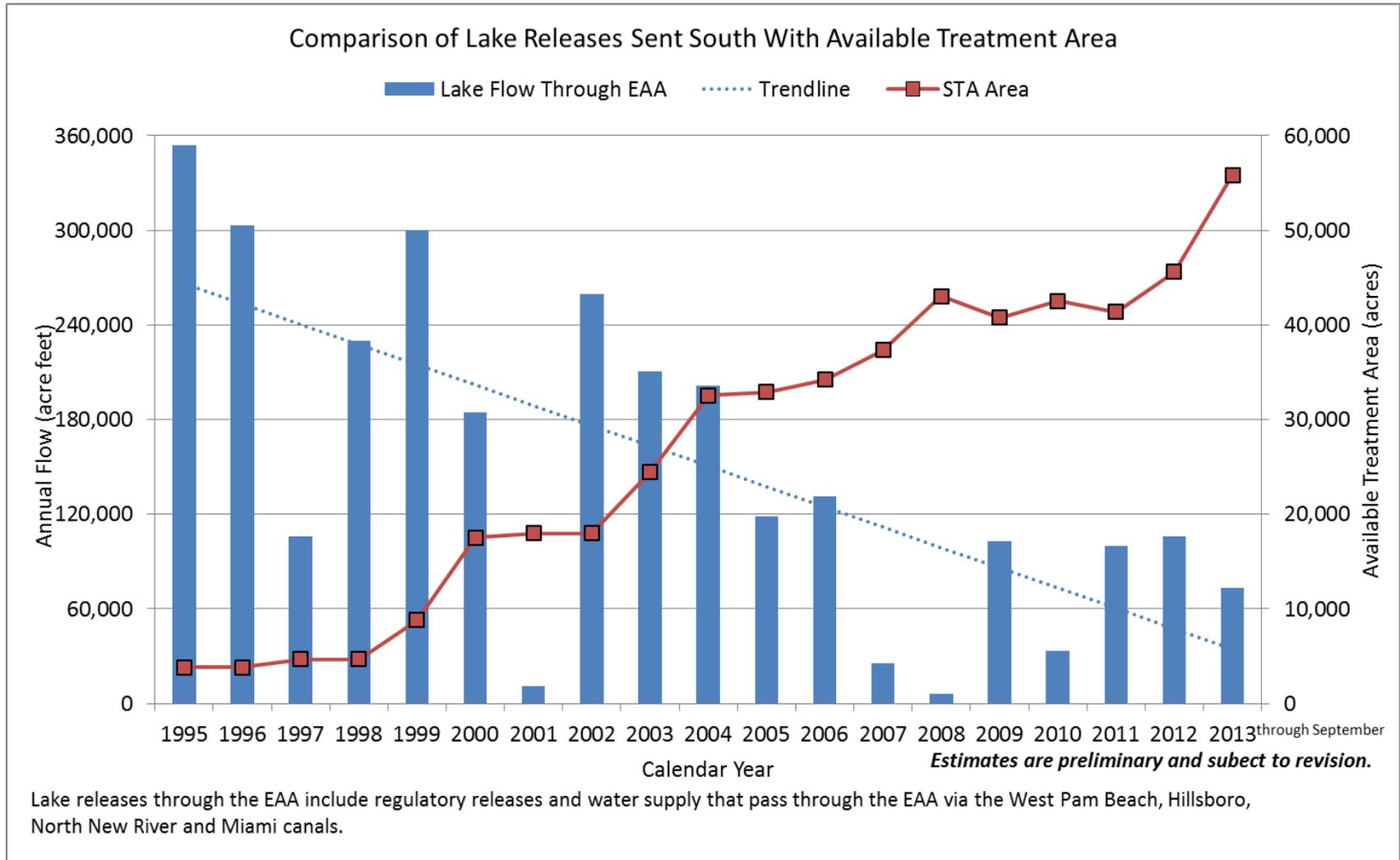




FIGURE 3.



**FIGURE 4.**



**1. General Background on the STAs (approximately 57,000 acres)**

- a. Several STA flow-ways are not being used for treatment of Lake releases, for example, the Eastern Flow-way of STA-1E (approximately 1,100 acres) has been off-line for over a year due to structure repairs by the U.S. Army Corps of Engineers (Corps). In addition, the 13,700-acre STA-5/6 has not been used to treat Lake releases through September of this year, despite available infrastructure to send the Lake releases to the STA, available treatment capacity and a need for water supply in the NW corner of WCA-3A directly downstream of STA-5/6.
- b. STA performance will likely decrease with a significant increase in Lake releases, but will return to normal over time.
  - i. Approximately 18 months were required for STA-1W to return to normal performance after it received 329,000 acre feet from July 2002 to February 2003. This volume equates to an average hydraulic load of 6.2 ft per month, where the hydraulic load is equal to the flow divided by the area, e.g.,  $329,000 \text{ acre feet} / 8 \text{ months} / 6,670 \text{ acres} = 6.2 \text{ ft per month}$ .
  - ii. By comparison, through September of 2013 approximately 57,000 acres of STAs have received approximately 75,000 acre feet of Lake releases. This equates to an average hydraulic load of under 0.15 feet per month, or less than  $1/40^{\text{th}}$  of the 2002-2003 loading rate. If a permit compliance issue arises, perhaps a “force majeure” defense may be appropriate; this might be strengthened with a declaration of emergency.

- 2. Holey Land Wildlife Management Area (approximately 35,000 acres).** The Holey Land restoration project was designed as for flow-through operation, however, it has largely been supplied with water from rainfall alone<sup>2</sup>. District’s data do not indicate that any Lake water has been sent to the Holey Land through September of 2013. However, the infrastructure exists today to send Lake releases to the Holey Land through a connection to the STA-3/4 inflow pump station (G-372). The Holey Land outlet structures (G-204, G-205 and G-206) could be operated to effect a flow-through operation that minimizes the increase in water depth. Although the routine objectives of Holey Land (e.g., ecosystem restoration and hunting) will be impacted by sending Lake releases through the WMA, during this time of emergency conditions perhaps these routine objectives should temporarily be considered secondary to public health and safety issues surrounding Lake Okeechobee releases that reduce the risk of failure of the Herbert Hoover Dike. Suggest the District consider sending a target of 0.5 ft of Lake releases to the Holey Land WMA per month. Note that this amount would not raise water levels by 0.5 ft since the load would

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<sup>2</sup> The inflow pumps (G-200) were destroyed in the 2004 hurricanes and not repaired.

be spread over 30 days. If applied evenly this would amount to an inflow of 0.2 inches per day, and the actual rise in water depth would be a function of the outlet capacity, rainfall and local hydrology. If a target hydraulic load of 0.5 feet per month could be achieved, approximately 17,500 acre feet of Lake releases could be treated in this WMA each month.

3. **Rotenberger Wildlife Management Area (approximately 27,000 acres).** The Rotenberger WMA currently receives treated discharges from STA-5/6, and is discharging water containing extremely low phosphorus concentrations (13 parts per billion). In prior years, Lake water has been sent to the Rotenberger, but during the current emergency conditions, no Lake releases have been sent to Rotenberger. The infrastructure (canal and pumps) exists today to send additional Lake releases to the Rotenberger WMA through structure G-373 and the STA-5/6 discharge canal. The Rotenberger inflow pump (G-410) has a capacity of 240 cubic feet per second, which equates to over 14,000 acre feet per month under ideal conditions. The Rotenberger outlet structures (G-302s) could be operated to effect a flow-through operation that minimizes the increase in water depth. Although the routine objectives of Rotenberger (i.e., ecosystem restoration and hunting) will be impacted by sending Lake releases through the WMA, during this time of emergency conditions perhaps these routine objectives should temporarily be considered secondary to public health and safety issues surrounding Lake Okeechobee releases that reduce the risk of failure of the Herbert Hoover Dike. Suggest the District consider sending a target of 0.5 ft of Lake releases to the Rotenberger WMA per month. Note that this amount would not raise water levels by 0.5 ft since the load would be spread over 30 days. If a target hydraulic load of 0.5 feet per month could be achieved, approximately 13,500 acre feet of Lake releases could be treated in this WMA each month.
4. **The 2008 Lake Okeechobee Regulation Schedule (LORS)** contains provisions that reduce the storage potential within Lake Okeechobee and create restrictions for the District to make additional releases to the south. Suggest the District formally request the Corps to revise these provisions, either within the existing LORS framework, or if that isn't possible, through a formal revision process. Examples:
  - a. As stated in the District's August 7 report on Lake releases<sup>3</sup> "Note that issues regarding the structural integrity of the Herbert Hoover Dike led to lowering the upper limit of the lake regulation schedule from 18.5 ft NGVD to 17.25 ft NGVD." Now that Corps has spent over \$300 million for rehabilitation projects which have

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<sup>3</sup> Assessing the Capability to Discharge Excess Lake Okeechobee Water South: Review of System Operations (January through mid-June 2013). Draft, August 7, 2013.

satisfied “the majority of the risk reduction goals”<sup>4</sup>, suggest that the District consider requesting the Corps to suspend the regulatory releases to the estuary when the Lake is below a stage of 16 ft NGVD, and to raise the upper limit of the schedule back to 18.5 ft NGVD.

- b. Also included in the District’s August 7 report on Lake releases was the following:  
“Lake Okeechobee regulatory discharges to the WCAs are constrained by water levels in the conservation areas. Specifically, federal regulations contained in the Water Control Plan prohibit lake regulatory releases to the WCAs when WCA water levels exceed their respective regulation schedules. Therefore, lake regulatory discharges are not made to the WCAs if WCA stages exceed their regulation schedules.”

However, EAA stormwater can be sent to the WCAs when WCA water levels exceed their respective regulation schedules. Suggest that the District consider requesting the Corps to revise any Water Control Plan that prohibits sending Lake regulatory releases into the WCAs during emergency conditions such as during operations that reduce the risk of failure of the Herbert Hoover Dike. Lake regulatory releases intended to reduce the risk of failure of the Herbert Hoover Dike (which would flood the EAA) should be treated with the same priority for public health and safety as flood protection for the same region.

### **Specific Suggestions For Increasing Lake Regulatory Releases to the STAs**

#### **1. STA-1E**

- a. Over 27,000 acre feet of Lake releases have been sent to STA-1E through September of this year, with an average hydraulic load of 0.6 ft per month.
- b. STA-1E discharges into WCA-1, which is currently below its regulation schedule.
- c. Eastern Flow-way – this 1,100 acre flow-way has been off-line for over a year while the Corps has been decommissioning a demonstration project. Suggest the District consider requesting the Corps to temporarily suspend the decommissioning during periods of Lake regulatory releases.
- d. During this time of emergency operations, consider increasing Lake releases to the maximum safe capacity through all flow-ways. If a target hydraulic load of 3 feet per month could be achieved, approximately 15,000 acre feet of Lake releases could be

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<sup>4</sup> Corps report: REVIEW PLAN For HERBERT HOOVER DIKE, April 18, 2002: “The implementation of the 21.4 mile cutoff wall component in Reach 1 satisfies the majority of the risk reduction goals.”

treated in this STA each month. Note that this target hydraulic load is less than one half the load sent to STA-1W during the 2002-2003 period.

## **2. STA-1W**

- a. Approximately 2.4 billion gallons of Lake releases have been sent to STA-1W through September of this year, with an average hydraulic load of 0.1 ft per month.
- b. STA-1W discharges into WCA-1, which is currently below its regulation schedule.
- c. The Western Flow-way has been receiving less than full flow to allow the treatment vegetation to “rest”.
- d. During this time of emergency operations, consider increasing Lake releases to the maximum safe capacity. If a target hydraulic load of 3 feet per month could be achieved, approximately 19,500 acre feet of Lake releases could be treated in this STA each month.

## **3. STA-2**

- a. Approximately 3.4 billion gallons of Lake releases have been sent to STA-2 through September of this year, with an average hydraulic load of 0.1 ft per month.
- b. During this time of emergency, consider increasing Lake releases to the maximum safe capacity through all flow-way. If a target hydraulic load of 3 feet per month could be achieved, approximately 46,500 acre feet of Lake releases could be treated in this STA each month.

## **4. STA-3/4**

- a. The 1994 Conceptual Design for the STAs anticipated an average of approximately 81.5 billion gallons per year of Lake regulatory releases would be sent to STA-3/4, with higher flows during some years. This equates to an average hydraulic load of 1.3 ft per month over the course of 12 months. However, less than 30,000 acre feet have been sent to STA-3/4 through September of this year, with an average hydraulic load of 0.2 ft per month.
- b. The north portion of WCA-3A routinely needs supplemental water which can be provided by STA-3/4 discharges.
- c. The Central Flow-way has been receiving less than full flow to reduce water levels sufficiently to allow the treatment vegetation to “rest”. An unintended consequence of reducing water levels in this flow-way during the spring is that this may have increased the opportunity for ground nesting birds to establish nests, which further restricted STA operations.
- d. During this time of emergency operations, consider increasing Lake releases to the maximum safe capacity. If a target hydraulic load of 3 feet per month could be

achieved, approximately 48,900 acre feet of Lake releases could be treated in this STA each month.

#### **5. STA-5/6**

- a. No Lake releases have been sent to STA-5/6 through September of this year.
- b. The north portion of WCA-3A routinely needs supplemental water which can be provided by STA-5/6 treated discharges.
- c. With the expansion to over 13,000 acres, dryout of the treatment area is often cited as a concern for long-term phosphorus removal performance. When a treatment cell dries out, the soil is exposed to air and a spike in phosphorus concentration often occurs upon rewetting. In addition, the dry treatment cells can become home for ground nesting and other protected birds, which further restrict STA operations.
- d. Canal conveyance capacity and water supply pumps exist today to send Lake releases to STA-5/6:
  - i. Close synchronization with the operation of the STA-3/4 and Rotenberger structures will be required to ensure the most effective operation of STA-5/6 to treat Lake releases.
  - ii. The divide structure G-373 could be opened, the STA-5/6 water supply pumps (G-507, G-349B, G-350B and G-509) could be turned on and the opening of G-411 could be coordinated with pump operations. The existing water supply pumps could be supplemented with temporary pumps to increase the volume of Lake water treated in the STA, if needed. Flexibility exists to transport the Lake water to the middle of the treatment cells' flow paths via the seepage return canals to increase the treatment effectiveness.
- e. During this time of emergency conditions, consider increasing Lake releases to the maximum safe capacity through all flow-ways. If a target hydraulic load of 0.5 feet per month could be achieved, approximately 6,800 acre feet of Lake releases could be treated in this STA each month.