RES 17-06

MEMORANDUM

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DATE: July 9, 2001

SUBJECT: Modeling of Everglades Agricultural Area Storage Reservoirs in SFWMM D13R Restudy Run

Summary

The proposed Everglades Agricultural Area (EAA) reservoirs are aboveground reservoirs with a total storage capacity of 360,000 acre-feet. The D13R Restudy design for the reservoirs assumes a total acreage of 60,000, divided into three equally sized compartments, with the water level fluctuating up to 6 feet above ground level in each compartment. The EAA reservoirs will serve a multi-purpose role in increasing flood protection in the Everglades Agricultural Area, meeting EAA irrigation requirements and Everglades water demands, reducing damaging flood releases from the EAA to the Water Conservation Areas, reducing damaging Lake Okeechobee regulatory releases to the estuaries, and improving the timing of environmental water deliveries to the Water Conservation Areas. Runoff from the Miami Canal and North New River Canal Basins of the EAA will be pumped into Compartment 1, while regulatory discharges from Lake Okeechobee will be pumped into Compartments 2 and 3. Compartment 1 discharges will be used to meet Everglades Agricultural Area irrigation demands only. Compartment 2 discharges will be used to meet environmental demands as a priority and can be used to supply a portion of agricultural demands if the environmental demands equal zero. Compartment 3 discharges will be used to meet environmental demands only.

Discussion

The South Florida Water Management Model (SFWMM), version 3.5, was used in modeling of Alternative D13R of the Restudy. Compartment 1 (called TALMAN in the SFWMM) is a 20,000 acre reservoir that receives excess runoff from the Miami and North New River Canal Basins in the EAA. The TALMAN reservoir encompasses eight grid cells in the model domain (rows 46-49, cols 17-18) with an average land surface elevation of 12.15'. The maximum stage allowed for structural inflow is 18.0', which results in a volumetric capacity of 117,000 ac-ft. A 2700 cfs inflow pump is used to remove runoff from the Miami Canal Basin, and a 2300 cfs inflow pump is used to remove runoff from the North New River Canal Basin. The primary outflow structures to the Miami and North New River-Hillsboro Canal Basins, for irrigation supply, are a 3062 cfs @ 6' head gravity structure and a 4409 cfs @ 6' head gravity structure, respectively. The secondary outflow structures to the Miami and North New River-Hillsboro Canal Basins, for irrigation supply, are 1837 cfs @ 6' head gravity structures for each basin. The secondary outflow structures are used only if the irrigation demands cannot be met with the primary outflow structures. An overflow weir releases water from the TALMAN reservoir to Compartment 2 (called EAARSN in the SFWMM) when the stage in the TALMAN reservoir reaches 17.7' (or 0.3' below the maximum stage of 18.0') and storage capacity is available in the EAARSN reservoir.

Compartment 2 and Compartment 3 (called EAARSS in the SFWMM) are 20,000 acre reservoirs that receive excess water from Lake Okeechobee (LOK). In the D13R run, Lake Okeechobee operates under a modified regulation schedule, with some forecasting, in order to take advantage of the additional storage facilities (i.e. North Storage, Lake Okeechobee ASR, EAA Reservoirs). Discharges from LOK to the EAARSN reservoir occur when the 3-month forecast predicts the LOK stage will be above the reservoir injection line, while discharges from LOK to the EAARSS reservoir occur when the current state of the LOK stage is above the reservoir injection line. The reservoir injection line based on LOK stage is 14.75' on January 1st, linearly decreases to 14.35' on June 1st, linearly increases back to 14.75' on

October 1st, and remains constant at 14.75' through December 31st. Canal conveyance capacities to the reservoirs are increased by 200 percent from current levels for the Miami and North New River Canals in order to direct LOK regulatory releases to the reservoirs. Environmental water supply deliveries to Water Conservation Area 3A (WCA-3A), via STA-3/4, occur when any of the downstream stages in Water Conservation Area 3A (3A-NE, 3A-NW, and 3A-4) fall below their specified target trigger. Gage 3A-NE is given by model cell row 40 col 23, gage 3A-NW is given by model cell row 40 col 18, and gage 3A-4 is given by model cell row 29 col 21. Environmental water supply demands are met by the EAARSS reservoir if enough storage exists; if not, then the EAARSN reservoir is also used to meet the unmet demands. The combined water supply deliveries from both reservoirs are limited to the STA-3/4 G372 inlet pump capacity of 3640 cfs simulated in Alternative D13R.

The EAARSN reservoir encompasses eight grid cells in the model domain (rows 46-49, col 19; rows 46-48, col 20; row46, col21) with an average land surface elevation of 12.49'. The maximum stage allowed for structural inflow is 18.0', which results in a volumetric capacity of 110,200 ac-ft. A 4500 cfs inflow pump is used to remove excess water from LOK through the Miami Canal, and a 3000 cfs inflow pump is used to remove excess water from LOK through the North New River Canal. The North New River Canal route is used only if the Miami Canal route cannot accommodate the total of the regulatory releases for one particular day. The environmental water supply outflow structures are a 3674 cfs @ 6' head gravity structure and a 750 cfs pump. The pump is used when EAARSN reservoir stages fall below land surface elevation and operates down to 1.99' below land surface elevation. The outflow structures to the Miami and North New River-Hillsboro Canal Basins, for irrigation supply, are 1837 cfs @ 6' head gravity structures for each basin. An overflow weir releases water from the EAARSN reservoir to the EAARSS reservoir when the stage in the EAARSN reservoir reaches 17.75' (or 0.25' below the maximum stage of 18.0') and capacity exists in the EAARSS reservoir to store additional water.

The EAARSS reservoir encompasses eight grid cells in the model domain (rows 44-45, col 21; rows 44-46, cols 22-23) with an average land surface elevation of 11.48'. The maximum stage allowed for structural inflow is 17.5', which results in a volumetric capacity of 120,400 ac-ft. A 4500 cfs inflow pump is used to remove excess water from LOK through the Miami Canal, and a 3000 cfs inflow pump is used to remove excess water from LOK through the North New River Canal. The North New River Canal route is used only if the Miami Canal route cannot accommodate the total of the regulatory releases for one particular day. The environmental water supply outflow structures are a 3674 cfs @ 6' head gravity structure and a 750 cfs pump. The pump is used when EAARSS reservoir stages fall below land surface elevation and operates down to 1.98' below land surface elevation.

Table 1 summarizes the structure information, as specified in the SFWMM, for the Everglades Agricultural Area Reservoirs. Table 2 summarizes the D13R 31-year mean annual flows for these structures.

References

1) http://www.sfwmd.gov/org/pld/restudy/hpm/index.html – description of model inputs for land-use and topography along with model results for Restudy runs (including D13R)

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Table 1: Structure Information for Everglades Agricultural Area Reservoirs as simulated in Alt D13R
(Bold items reference names of flow structures and reservoirs as used in the SFWMM)

	Source/Destination of Water	*Structure Type*	*Design Capacity*
***TALMAN** Reservoir*			
Structural Inflows			
TALIN1	Miami Canal Basin	pump	2700 cfs
TALIN2	North New River Canal Basin	pump	2300 cfs
Structural Outflows			
TALMA1	Miami Canal Basin	gravity structure	$Q=1250(\Delta h)^{0.5}$ 3062 cfs @ 6'
TALMA2	Miami Canal Basin	gravity structure	$Q=750(\Delta h)^{0.5}$ 1837 cfs @ 6'
TALNH1	North New River/Hillsboro Canal Basin	gravity structure	$Q=1800(\Delta h)^{0.5}$ 4409 cfs @ 6'
TALNH2	North New River/Hillsboro Canal Basin	gravity structure	$Q=750(\Delta h)^{0.5}$ 1837 cfs @ 6'
TALMNO	**EAARSN** Reservoir	weir	$Q=3000(\Delta h)^{1.5}$ 493 cfs @ 0.3'
***EAARSN** Reservoir*			
Structural Inflows			
LKRSM1	Lake Okeechobee – thru Miami Canal	pump	4500 cfs
LKRSN1	Lake Okeechobee – thru NNR Canal	pump	3000 cfs
TALMNO	**TALMAN** Reservoir	weir	$Q=3000(\Delta h)^{1.5}$ 493 cfs @ 0.3'
Structural Outflows			
WCS4N	Water Conservation Area 3A, via STA 3/4	gravity structure	$Q=1500(\Delta h)^{0.5}$ 3674 cfs @ 6'
EVBLSN	Water Conservation Area 3A, via STA 3/4	pump	750 cfs
WSTMB	Miami Canal Basin	gravity structure	$Q=750(\Delta h)^{0.5}$ 1837 cfs @ 6'
WSTNRH	North New River/Hillsboro Canal Basin	gravity structure	$Q=750(\Delta h)^{0.5}$ 1837 cfs @ 6'
EARSNO	**EAARSS** Reservoir	weir	$Q=3000(\Delta h)^{1.5}$ 375 cfs @ 0.25'
***EAARSS** Reservoir*			
Structural Inflows			
LKRSM2	Lake Okeechobee – thru Miami Canal	pump	4500 cfs
LKRSN2	Lake Okeechobee – thru NNR Canal	pump	3000 cfs
EARSNO	**EAARSN** Reservoir	weir	$Q=3000(\Delta h)^{1.5}$ 375 cfs @ 0.25'
Structural Outflows			
WCS4S	Water Conservation Area 3A, via STA 3/4	gravity structure	$Q=1500(\Delta h)^{0.5}$ 3674 cfs @ 6'
EVBLSS	Water Conservation Area 3A, via STA 3/4	pump	750 cfs

Table 2: Summary of D13R Restudy EAA Reservoir Flows
(Bold items reference names of flow structures and reservoirs as used in the SFWMM)

	Mean Annual Flows
	(1000 ac-ft)
TALMAN *Reservoir*	
Structural Inflows	
TALIN1	68.9
TALIN2	96.4
Structural Outflows	
TALMA1	64.9
TALMA2	1.8
TALNH1	70.9
TALNH2	3.9
TALMNO	6.6
EAARSN *Reservoir*	
Structural Inflows	
LKRSM1	231.5
LKRSN1	29.6
TALMNO	6.6
Structural Outflows	
WCS4N	195.7
EVBLSN	4.4
WSTMB	1.7
WSTNRH	3.5
EARSNO	55.1
EAARSS *Reservoir*	
Structural Inflows	
LKRSM2	10.7
LKRSN2	3.8
EARSNO	55.1
Structural Outflows	
WCS4S	65.5
EVBLSS	5.9