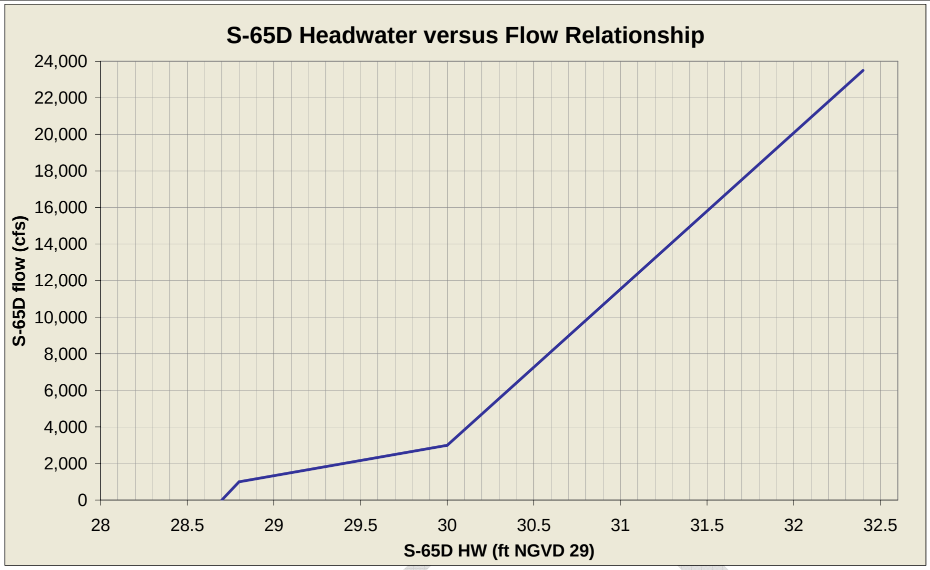
DRAFT RSM Modeling in Support of Northern Everglades Technical Plan

Future Base (circa 2015) Assumptions

Feature	Entire Model Domain
General	• Model should reflect conditions around the year 2015 when all Acceler8 project are in place. The future condition also assumes that the Kissimmee River Restoration and the Kissimmee River Headwaters Revitalization projects are in place. • Period of simulation is 1970 to 2005. • Model timestep is daily. • All elevations are in feet NGVD 29.
	Upper Kissimmee Sub-watershed (KUB)
General	• Same as in current base.
Climate	• Same as in current base.
Model Setup	• Same as in current base.
Stage-Volume-Area Relationships	• Same as in current base.
Sub-watershed Inflows	• Same as in current base.
Structure Capacity	• Same as in current base.
Operations	• The lakes and water control structures are regulated by rigid schedules as defined in the Kissimmee Basin Water Supply Plan (SFWMD, 2000). An exception is Lake Kissimmee which is simulated in the model using the headwaters revitalization schedule.
	Lower Kissimmee Sub-watershed (LKB)
General	• Model reflects conditions after full Kissimmee River Restoration (KRR) around the year 2015. • It is assumed that there is no connection between Lake Istokpoga and the Kissimmee River (i.e. G-85 is assumed closed).
Climate	• Same as in current base.
Model Setup	• The Lower Kissimmee sub-watershed is partitioned into three major basins reflecting full (Phases I-IV) KRR: S65A, S65BCD and S65E. Only the C-38 canal, the Kissimmee River and floodplain portions of these basins are simulated as level pools: Pool A, BCD, D and E.

Stage-Volume-Area Relationships	• Stage-volume and stage-area relationships for the two channelized reaches are those developed as part of the KBMOS effort. Stage-volume and stage-area relationships have been recently developed for Pool BCD as part of this modeling effort.
Sub-watershed Inflows	• Same as in current base.
Structure Capacity	• Only the major gated spillway structures in place after full KRR are included: S-65A, S-65D, S-65E. Culverts and overflow weirs next to these structures are not modeled with the exception of the three broad-crested weirs at the tieback levee of S-65A which are modeled. Locks at these structures are not modeled. • S-65B, S-65C and WEIRS 1,2,3 are not included in the simulation as they were removed as part of KRR. • U-shaped weir to be installed just upstream of S-65D as part of the full KRR is not modeled. • Rating curves developed by Ansar, et al. based on dimensionless analysis were used in simulating these gated spillways (Appendix A). • Gates are assumed to always be fully open. • Maximum historical discharges are used to limit flow through these structures with the exception of S-65D where limit reflects two additional gates that will be added as part of KRR: S-65A: 13,100 cfs S-65D: 28,000 cfs S-65E: 27,900 cfs
Operations	• S-65A and S-65E are operated for flood control based on a constant optimum headwater stage (flood control trigger level). S-65A: 46.3 ft S-65E: 21.0 ft • S-65D is operated for flood control based on the following headwater-flow relationship.

	 During a timestep, a structure will try to remove any volume of water stored above this flood control trigger level, plus any basin inflows subject to the structure capacity and limited to its design capacity.
Taylor Creek/Nubbin Slough Sub-watershed (TCNS)	
General	• Same as in current base.
Climate	• Same as in current base.
Model Setup	• Same as in current base.
Stage-Volume-Area Relationships	• Same as in current base.
Sub-watershed Inflows	• Same as in current base.
Structure Capacity	• Same as in current base.
Operations	• Same as in current base.
Lake Istokpoga Sub-watershed	
General	• Same as in current base.
Climate	• Same as in current base.
Model Setup	• Same as in current base.
Stage-Volume-Area	• Same as in current base.

Relationships	
Sub-watershed Inflows	• Same as in current base.
Structure Capacity	• Same as in current base.
Operations	• Same as in current base.
Fisheating Creek Sub-watershed	
General	• Same as in current base.
Climate	• Same as in current base.
Model Setup	• Same as in current base.
Stage-Volume-Area Relationships	• Same as in current base.
Sub-watershed Inflows	• Same as in current base.
Structure Capacity	• Same as in current base.
Operations	• Same as in current base.
Lake Okeechobee Sub-watershed	
General	• Future base simulation based on SFWMM 2010A8 run
Climate	• Same as in current base.
Model Setup	• Lake Okeechobee modeled as a "lake" in the Regional Simulation model with established stage-area and stage-volume relationships. Rainfall is part of the MDS term. ET simulated using the same methodology as in the SFWMM.
Stage-Volume-Area Relationships	• Same as in SFWMM
Sub-watershed Inflows	• Historical flows are applied for the Fisheating Creek, Lake Istokpoga and Taylor Creek/Nubbin Slough sub-watersheds. Backflows coming from the east, west and south of Lake Okeechobee as simulated in the SFWMM will be input as boundary conditions in RSM. S65E flows into Lake Okeechobee will be simulated.
Structure	• Same as in SFWMM

Capacity	
Operations	• Regulatory releases to the estuaries are simulated based on the WSE schedule. Based on the SFWMM equivalent run, regulatory releases south directly to the STAs or through C-10A are zero. • Regulatory releases to the EAA reservoir will be fixed based on the SFWMM simulation output. Likewise, EAA reservoir flows to meet EAA demand will also be fixed boundary conditions. • Due to interaction between the C-43 reservoir and Lake Okeechobee, the C-43 reservoir will be simulated with similar operations as in the SFWMM. • The C-44 reservoir will not be explicitly simulated but the contribution of the C-44 project as simulated in another model, the SFWMM, will be incorporated. The time series of C-44 reservoir releases (as simulated in SFWMM) and the RSM-simulated Lake Okeechobee releases will be combined to evaluate the total impact on St. Lucie Estuary. • Individual LOSA basin demands are boundary conditions. Water management cutback scheme based on hybrid LOWSM operations. EAA conveyance cutbacks are not currently simulated but fixed based on SFWMM output. • NETP sub-watersheds: Same as in current base. • All other inflows and outflows are fixed boundary conditions.

Appendix A

Table 1 - Spillway equations based on dimensional analysis
From "Dimensionless Flow Ratings at Kissimmee River Gated Spillways" Tech Pub SHDM report, Operations and Hydro Data Management Division, SFWMD (M. Ansar, Z. Cheng, J. A. Gonzalez & M. J. Chen)

Flow Condition	Equation	Restriction	Remarks
Controlled Submerged (CS)	$Q = L\sqrt{g{y_c}^3}$ $y_c = aG_o\left(\frac{H-h}{G_o}\right)^b$ a = 1.04, b = 0.30	$\frac{h}{G_o} \geq 1.0$	Also known as submerged orifice
Controlled Free (CF)	$Q = L\sqrt{g{y_c}^3}$ $y_c = aG_o\left(\frac{H}{G_o}\right)^b$ a = 0.86, b = 0.35	$\frac{h}{G_o} < 1.0 \;\&\; \frac{H}{G_o} \geq \frac{1}{K}$ $K = 2/3$	Also known as free orifice
Uncontrolled Submerged (US)	$Q = L\sqrt{g{y_c}^3}$ $y_c = aH(1-\frac{h}{H})^b$ a = 0.838, b = 0.167	$\frac{h}{G_o} < 1.0, \frac{H}{G_o} < \frac{1}{K}, \& \frac{h}{H} \geq K$ $K = 2/3$	Also known as submerged weir
Uncontrolled Free (UF)	$Q = L\sqrt{g{y_c}^3}$ $y_c = aH$ a = 0.7	$\frac{h}{G_o} < 1.0, \frac{H}{G_o} < \frac{1}{K}, \& \frac{h}{H} < K$ $K = 2/3$	Also known as free weir
Transitional Flow	No transition region		

In the table, the flow equation coefficients for the Kissimmee River spillways are shown.

H: head water above CEL (ft) = HW-CEL;
h: tail water above CEL (ft) = TW-CEL;
g: gravitational acceleration, 32.2 ft^2/s;
G_o: gate opening (ft); *L*: spillway width (ft);
y_c: critical depth (ft); *Q*: computed discharge (cfs)

Note: Coefficients a and b only apply to Kissimmee River gated spillways.