PLATO
CONSULTING, INC.
A Leadership & Information Technology Company

South Florida Water Management District
Strategic Modeling Plan

July 15, 2003

It's People Who Make The Difference

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EXECUTIVE SUMMARY:

A SFWMD white paper on the future of modeling developed in 1999 and a 2002 Inspector General audit of 'Hydrologic Modeling Program, System Development Life Cycle" both recommended the development of a Strategic Modeling Plan. Subsequently Plato Consulting, Inc. was retained to develop a Strategic Modeling Plan with specific focus on the organization structure and functions of modeling. To that end, Plato Consulting conducted an assessment, examined the future needs of modeling, formulated recommendations and suggested time frames for implementing those recommendations.

During the assessment it was discovered that 53 of 56 modelers are located in West Palm Beach. These modelers are involved in model development, implementation and application. The 53 modelers in West Palm Beach are distributed within 10 divisions and 4 departments. This distribution is a roadblock to effective communication and consistent application of a process or set of processes to develop, implement or apply models.

Overall the District is lacking a consistent methodology to apply to the modeling effort. This deficiency contributes to inconsistent peer reviews, poor documentation of models, inadequate training for modelers, and inadequate project planning and management. Subsequently we recommend the District adopt and implement a methodology to be used for model development, implementation and application. To institute the methodology as quickly as possible we recommend the District centralize all model development efforts and centralize regional model implementation and application. To ensure a successful implementation of the methodology a strong executive sponsor is required to consistently support the effort. A proposed project charter for the methodology is included in appendix B. The charter outlines the effort, time frame and cost to implement the methodology.

The successful adoption and implementation of a methodology will facilitate among other things:

- Communications between Project Managers, Clients and Modelers
- Good consistent end to end documentation on models and data used
- More effective code
- More maintainable models
- Better project management

Models require significant amounts of readily available, accessible and quality assured data for calibration, verification and application. Often times the modelers find themselves involved in the quality assurance of data. The confidence of some of the modelers in some of the available data sets is low. Recently, the SFWMD has embarked on several initiatives to improve the availability, reliability and quality of data. Plato Consulting recommends the continuation of those initiatives.

INTRODUCTION:

The South Florida Water Management District (SFWMD) currently uses and will continue to use scientific and engineering models to enhance their understanding of the environment and to facilitate the decision making process. The United States Army Corps of Engineers (USACE) and the SFWMD are full partners in the Comprehensive Everglades Restoration Plan (CERP). The CERP will require considerable modeling activities to support CERP projects and Restoration Coordination and Verification (RECOVER). With CERP the visibility of modeling efforts has been heightened. Accompanying this visibility is added pressure to ensure the soundness of the science and processes that are applied to the modeling effort.

In 1999, a District white paper entitled "The Future of Modeling at the SFWMD" recommended that a strategic modeling plan be developed. According to the white paper, having a strategic modeling plan would help:

- Improve management practices, coordination and culture (includes the consistency of model development and implementation)
- Increase modeler productivity
- Plan for future needs

The Office of Inspector General completed an audit of the "Hydrologic Modeling Program, System Development Life Cycle" in 2002 which recommended that "a strategic hydrologic plan be prepared". With this in mind Plato Consulting, Inc. was engaged to develop a strategic modeling plan to include a:

1. review of existing structure and functions of all modeling efforts
2. develop a report on the assessment of the current structure and functions
3. review future modeling needs
4. develop a report summarizing future modeling needs
5. develop a plan to include:
    i. a suggested organization structure
    ii. resource requirements
    iii. implementation strategy
    iv. 5-year budget

METHODOLOGY:

To review the existing structure and functions and to develop an assessment report Plato Consulting:

- Reviewed over 25 documents
- Attended more than 20 meetings with District and non-District staff
- Developed and distributed a model survey form and reviewed over 80 responses
- Reviewed organizational charts
- Reviewed the "Information Technology Needs Analysis" document
- Created and received user feedback on:
    - Strengths and Weaknesses document
    - List of models supporting CERP projects
    - FTE requirements for models
    - Annotated List of Models

Based on the information gathered through the above activities, the following areas were assessed: organization; staffing; models and data; training and documentation; information technology; and models that are supporting projects. Strengths and weaknesses were identified to ferret out inefficiencies, inconsistencies, vulnerability and adequacy of IT resources and training. The annotated list of models is also presented with this assessment.

ASSESSMENT OF MODELING:

Organization:

The following organization chart depicts where 53 of the 56 identified modelers are located in West Palm Beach. The other 3 modelers are located on the West Coast: one at the Ft. Myers Office and two at the Big Cypress Basin office. The shaded areas highlight the location of modelers involved in model development, model implementation and model application in West Palm Beach.

Model development comprises:

- Code Development
- Design
- Algorithm Testing
- Documentation

Model implementation comprises:

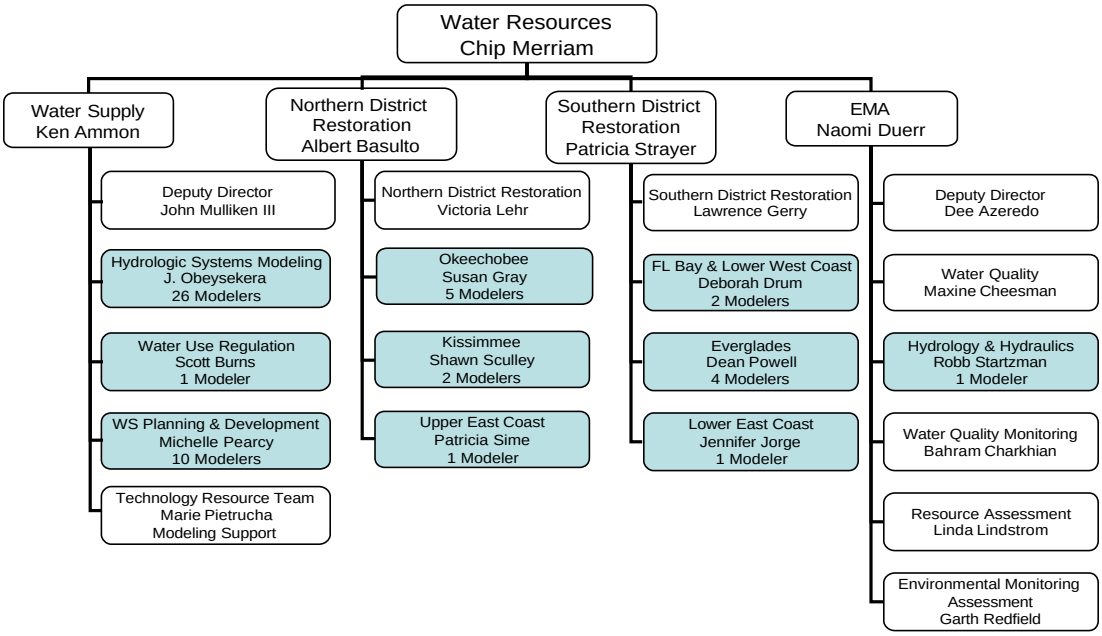
- Data set development
- Calibration
- Verification
- Sensitivity analysis
- Reports

Model application is the repetitive application of a model to a particular project.

Any code development or modification required as a result of model implementation would be considered model development.

Thirty-nine of the 53 modelers in West Palm Beach are located within 3 divisions of the Water Supply Department. The remaining 16 modelers are distributed in 7 divisions within 3 departments. Twenty-six of the 53 modelers are engaged in regional modeling. These 26 modelers are responsible for 37 of the 83 identified models (Appendix A – Annotated List of Models). Modeling activities at the District are augmented with contractual staff, the extent of which varies annually. Excluding the 3 modelers on the West Coast, the modeling effort is centralized within the Water Resources business area but is split amongst 4 departments and 10 divisions. Five of the 10 divisions house 2 or fewer modelers.

The Technology Resource Team (TRT) Division provides most of its support to activities within the Water Supply Department. The services provided by TRT are in high demand and there is much competition for their services. The Everglades Division of the Southern Restoration Department, for example, reports little support for modeling. The support provided by the Information Technology Department is not sufficient to satisfy the requirements of the modeling community. The Information Technology Needs Analysis conducted in 2002 highlighted a number of areas in need of improvement.



Twenty-six of the 53 modelers are located in the Hydrologic Systems Division. These modelers are directed by the mission "to develop and apply water resource system models for evaluation of multi-objective water management strategies. This mission will be accomplished by developing accurate and efficient system-wide resource models and analysis tools for evaluating the performance of water management alternatives with respect to the District's mission elements." The other modelers lack a model-specific vision that might account for the seemingly disjointed modeling efforts.

Many employees commented on the lack of a cohesive approach to modeling. One employee stated that there is a "lack of common standards for modeling and database systems". Another mentioned the "absence of a top-down, coherent water quantity-quality modeling strategy". Some statements of work for modeling have been executed without sufficient review from an overall District perspective.

During the interviews it was noted that coordination and information sharing between regional, sub-regional and project modeling is insufficient. Many modelers interviewed spoke highly of the Model User Group that had been established several years ago to facilitate communication between modelers District-wide. Communications increased with the establishment of the user group, however, once they attempted to do more than just meet for "brown bag lunches" they were unable to garner management support for their efforts and the user group fell apart. Today, communication is infrequent between the separate groups. Because of inadequate communications, problems are not being addressed at the model development stage where it would be less expensive and more efficient to

resolve. The fragmented nature of the location of modeling staff within the organizational structure is a barrier to collaboration.

Staffing:

Table 1 below depicts the reported level of support provided to each model by the modeling staff. Overall, 50.67 FTEs of effort is expended on these models. The number of FTEs expended on modeling efforts is lower than the actual number of FTEs assigned to modeling because model staff is often times directed to satisfying information requests, putting out "brush fires", and evaluating and quality assuring data. There is a good concentration of staff on the regional models such as the South Florida Water Management Model and the Regional Simulation Model. The extent of FTE dedication to the remaining models is small in comparison and widely distributed. The effort associated with some models, for example, the Dynamic Model for Water Treatment Areas is contracted out. Overall, 14.23 FTEs are assigned to Model Development, 17 FTEs to Model Implementation and 19.44 FTEs to Model Application.

The effort to ascertain the mandate type (1, 2 or 3) associated with each project was inconclusive. Mandate type 1 is the highest level priority. Mandate type 2 is the next highest level. Mandate type 3 is the lowest level priority. Hence, one could not determine the number of modeling FTEs associated with each type of mandate.

Table 1

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
BASINS			**0.02**	**0.02**	▪ **Comprehensive Integrated Water Quality Feasibility Study ( )**
Biscayne Bay TABS-MDS			**1.2**	**1.2**	▪ **Biscayne Bay MFLs ( )** ▪ **Biscayne Bay Coastal Wetlands (2)** ▪ **L-31N Seepage Control (2)** ▪ **C-111 Spreader Canal (2)**
C-4 Basin Integrated Surface Groundwater Model		**1.5**		**1.5**	▪ **C-4 General Reevaluation Report ( )** ▪ **CERP / Permitting Efforts ( )**
C139 Basin TP Load Mass Balance Model			**0.1**	**0.1**	▪ **C139 Basin Total Phosphorus Load compliance determinations ( )**
Cascade			**0.05**	**0.05**	▪ **Any land use model ( )** ▪ **Land use change ( )**
CH3D				**0**	▪ **Caloosahatchee MFLs (2)** ▪ **Estero Bay MFLs (2)**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
Combination of: HEC-HMS / HEC-RAS / UNET	**0.2**	**1**		**1.2**	▪ **C-51 Basin Rule Reevaluation Study ( )** ▪ **ACME Basin B (2)** ▪ **N. Palm Beach County (2)** ▪ **CERP projects ( )**
CREAMS-WT		**0.25**		**0.25**	▪ **Operational Planning (3)**
DMSTA (Dynamic Model for Stormwater Treatment Areas)			**0.01**	**0.01**	▪ **C-111 Detention Area ( )** ▪ **C-111 Spreader Canal (2)** ▪ **EAA Storage Reservoirs Phase 1 (2)** ▪ **CERP projects ( )**
EAA Basin TP Load Mass Balance Model			**0.1**	**0.1**	▪ **EAA Basin Total Phosphorus Load compliance determinations ( )**
EAA BMP Makeup Water Model			**0.05**	**0.05**	▪ **EFA ( )** ▪ **EAA Basin ( )**
EAA TP Load Reduction			**.15**	**.15**	▪ **Federal Settlement Agreement compliance tracking of load reductions to the EPA region (2)**
EAAMOD/ WAMView				**0**	▪
EFDC: UEC Estuary Water Quality Model				**0**	▪ **Indian River Lagoon-S CERP Project (2)** ▪ **St. Lucie Estuary Pollutant Load Reduction Goal ( )**
Environmental Fluid Dynamic Code (EFDC)			**0.25**	**0.25**	▪ **Florida Bay Feasibility (2)** ▪ **Florida Bay Tidal Restoration (2)** ▪ **Lake Worth ( )** ▪ **Lake Okeechobee ( )** ▪ **St. Lucie ( )** ▪ **Biscayne Bay ( )**
ET_SF			**0.02**	**0.02**	▪ **All District projects ( )** ▪ **CERP projects ( )** ▪ **RECOVER (2)**
Everglades Agricultural Area Model (EAAMOD) LOK				**0**	▪ **Best Management Practice plans (3)**
Everglades Landscape Fire Model			**0.25**	**0.25**	▪ **Everglades (cattail expansion & fire management) ( )** ▪ **DECOMP (2)**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
Everglades Landscape Model			**0.9**	**0.9**	▪ **CSOP ( )** ▪ **CERP Initial Update ( )** ▪ **DECOMP (2)** ▪ **Downstream impacts of STAs re. the EFA (1)**
Everglades Landscape Vegetation Model—Mangrove Module	**0.25**			**0.25**	▪ **Florida Bay (2)** ▪ **RECOVER (2)**
Everglades Landscape Vegetation Model—SAWCAT Module	**0.25**			**0.25**	▪ **Everglades (cattail expansion) ( )** ▪ **DECOMP (2)**
Everglades Mercury Cycling Model (E-MCM)		**0**		**0**	▪ **TP WQS ( )** ▪ **ECP: STA-2 Cell 1 ( )** ▪ **TMDL Pilot Study ( )** ▪ **TMDLs: Hg TMDLs for Everglades and Florida Bay ( )** ▪ **Lake Okeechobee Restoration ( )** ▪ **Kissimmee River Restoration ( )** ▪ **EAA Reservoir (2)** ▪ **ASR Regional Study (2)** ▪ **Lakebelt (2)** ▪ **C-111 (2)** ▪ **Lake O. Watershed (2)**
Everglades Ridge & Slough Model (ERSM)	**0.25**			**0.25**	▪ **Everglades restoration ( )** ▪ **DECOMP (2)**
Everglades Screening Model (ESM)				**0**	▪
Everglades Tree Island Model (ETIM)			**0**	**0**	▪ **WCA-3 ( )** ▪ **WCA-2A ( )** ▪ **WCA-1 ( )** ▪ **ENP ( )** ▪ **DECOMP (2)**
FEMWATER123 /WASH123			**0.02**	**0.02**	▪ **C-111 Detention Area (2)** ▪ **C-111 Spreader Canal (2)** ▪ **L-31N Seepage Management (2)**
FESWMS		**0.05**		**0.05**	▪ **ENR ( )**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
Field Hydrologic And Nutrient Transport Model (FHANTM)				**0**	▪ **Best Management Practices (BMP) plans (3)**
Florida Bay Seagrass Community Ecosystem Process Model	**0.25**			**0.25**	▪ **Florida Bay Feasibility Study (2)** ▪ **Florida Keys Feasibility Study ( )** ▪ **Florida Bay MFLs ( )**
Flow Program		**1.5**		**1.5**	▪ **Real-time flow calculations ( )** ▪ **One Flow Initiative ( )** ▪ **Nutrient Load Calculations ( )** ▪ **Water Management Information System ( )**
GOH Model			**0.1**	**0.1**	▪ **Water Supply Plans ( )** ▪ **CERP ( )**
Groundwater Drought Management Model	**0.99**			**0.99**	▪ **Drought management ( )**
HEC RAS (Steady and Unsteady State)			**0.3**	**0.3**	▪ **Southern Golden Gate Estates Project (2)** ▪ **Big Cypress Basin Watershed Management Plan ( )** ▪ **Big Cypress Basin - all hydrologic & hydraulic assessment projects ( )** ▪ **Corkscrew Canal design ( )** ▪ **Henderson Creek Canal design ( )** ▪ **Golden Gate Main Canal design ( )** ▪ **C-1 Connector Canal design ( )** ▪ **North Faka Union Canal design ( )**
HEC-1/UNET			**0.05**	**0.05**	▪ **Loxahatchee Slough Restoration ( )** ▪ **Loxahatchee Slough Structure ( )** ▪ **G-160 Hydraulic Modeling ( )** ▪ **Northern Palm Beach County Comprehensive Water Supply Plan ( )** ▪ **Loxahatchee Impact Analysis ( )**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
HEC-2		**0.05**		**0.05**	▪ **Canal Conveyance Capacity Program (multiple projects) ( )** ▪ **ENR Supply Canal Hydraulic Analysis ( )**
Hendry County	**0.5**			**0.5**	▪
HSPF				**0**	▪
KB/ECF	**1.55**			**1.55**	▪ **Kissimmee Basin Water Supply Plan (3)** ▪ **Surficial/ Floridan Interaction Study ( )**
Lake Okeechobee Environment Model		**0.8**		**0.8**	▪ **Lake Okeechobee Sediment Management Feasibility Study (2)** ▪ **Lake Recession Project ( )** ▪ **Lake Okeechobee Water Quality study ( )** ▪ **SAV study ( )** ▪ **Lake Okeechobee TMDL ( )** ▪ **Regional ASR Study (2)**
Lake Okeechobee Water Quality Model		**0.7**		**0.7**	▪ **Lake Okeechobee Protection Plan ( )** ▪ **Sediment Management Feasibility Study (2)** ▪ **CERP Initial Update ( )**
LOADSS		**0.25**		**0.25**	▪
Lower East Coast Regional (LECR) MODFLOW Model	**1.85**			**1.85**	▪ **Water Supply Plans ( )** ▪ **CERP projects ( )** ▪ **Construction projects ( )** ▪ **Biscayne Bay MFLs ( )** ▪ **Biscayne Aquifer MFLs (2)**
Loxahatchee Refuge Model				**0**	▪
Loxahatchee River Hydrodynamics/ Salinity Model (TABS-MDS)				**0**	▪ **Loxahatchee River MFLs (2)** ▪ **North Palm Beach CERP (2)**
LWC Floridan Model	**0.2**			**0.2**	▪ **Lower West Coast Water Supply Plan ( )**
Miami-Dade County Integrated Surface Groundwater Model		**1.5**		**1.5**	▪ **Miami-Dade Regional Canal Study ( )** ▪ **CERP / Permitting Efforts ( )**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
MIKE 11			**0.25**	**0.25**	▪ **Big Cypress Basin Watershed Management Plan ( )** ▪ **Southern Golden Gate Estates (2)** ▪ **EAA Impoundments Project (CERP) (2)** ▪ **Corkscrew Canal Channel Improvements ( )** ▪ **Henderson Creek Canal Channel Improvements ( )** ▪ **C1 Connector Channel Improvements ( )** ▪ **Golden Gate Canal Channel Improvements ( )**
MIKE SHE			**0.3**	**0.3**	▪ **Big Cypress Basin Watershed Management Plan ( )** ▪ **Southern Golden Gate Estates Hydrologic Restoration (2)** ▪ **EAA Impoundments Project (CERP) (2)** ▪ **Southwest Florida Feasibility Study (2)** ▪ **C43 Basin Storage Reservoir (2)** ▪ **Lower West Coast Water Supply Plan Initiatives ( )** ▪ **Corkscrew Canal design ( )** ▪ **Henderson Creek Canal design ( )** ▪ **Belle Meade Watershed Plan ( )** ▪ **Lake Trafford Watershed Plan (1)**
Models developed by consultants or District Staff for permit			**1**	**1**	▪ **Permitting**
MODBRANCH				**0**	▪
MODFLOW				**0**	▪
MODNET		**0.7**		**0.7**	▪ **C-4 Basin Assessments ( )** ▪ **C-4 GRR ( )** ▪ **C-111 Spreader Canal Project (2)**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
MT3D (Modular Three-Dimensional Transport model)			**0.05**	**0.05**	▪ **C-111 Detention Area ( )** ▪ **C-111 Spreader Canal (2)** ▪ **L-31N Seepage Management (2)**
Multi Basin Routing (MBR)		**0.3**		**0.3**	▪ **Hungryland Slough restoration ( )** ▪ **Sandhill Tract (phase II) restoration ( )**
Natural System Model (NSM)	**1**	**0.2**		**1.2**	▪
ORM (Object oriented Routing Model)	**0**			**0**	▪ **Operational Planning Projects (1)**
Pal-Mar Cypress Creek and the Groves Basin Study			**0.15**	**0.15**	▪ **North Palm Beach County CERP (2)** ▪ **Loxahatchee MFLs ( )** ▪ **Cypress Creek Property Restoration ( )**
Regional MODFLOW				**0**	▪ **Biscayne Bay MFLs (2)** ▪ **Biscayne Bay Coastal Wetlands (2)** ▪ **L-31N Seepage Control (2)** ▪ **C-111 Spreader Canal (2)**
Regional Simulation Model (RSM)	**2.5**	**7.2**	**0.2**	**9.9**	▪ **SouthWest Florida Feasibility Study (2)** ▪ **Lower West Coast Water Supply Plan ( )**
SAVEcosystem	**0.25**			**0.25**	▪ **LOEM Development ( )** ▪ **Lake Okeechobee Protection Act ( )** ▪ **RECOVER (2)** ▪ **CERP ( )**
SEEP-2D		**0.05**		**0.05**	▪ **ENR ( )**
SEAWAT/SICS			**0**	**0**	▪ **C-111 Detention Area ( )** ▪ **C-111 Spreader Canal (2)** ▪ **L-31N Seepage Management (2)**
SFWMM	**3**	**0.9**	**12.7**	**16.6**	▪ **Biscayne Bay Coastal Wetlands (2)** ▪ **Biscayne Bay MFLs (2)** ▪ **CERP ( )** ▪ **CSOP ( )** ▪ **IOP (2)** ▪ **ISOP ( )** ▪ **LEC H2O Reservations ( )** ▪ **Operational Planning (1)** ▪ **Water Supply Plans ( )**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
SHEET-2D		**0.05**		**0.05**	▪ **CERP ( )** ▪ **Water Supply Plans ( )** ▪ **Operational Planning (1)** ▪ **ECP (1)** ▪ **Reservations (3)**
Southern Miami-Dade WASH123D			**0.3**	**0.3**	▪ **ENR ( )**
South Florida Nonpoint Source Pollution (SFNPS) Model	**0.2**			**0.2**	▪ **Biscayne Bay MFLs (2)** ▪ **Biscayne Bay Coastal Wetlands (2)** ▪ **L-31N Seepage Control (2)** ▪ **C-111 Spreader Canal (2)**
St. Lucie Estuary/IRL Hydrodynamics/ Salinity Model (TABS-MDS)				**0**	▪
SWAN (Simulation WAves Nearshore)			**0.2**	**0.2**	▪ **Indian River Lagoon Restudy (CERP) (2)** ▪ **St. Lucie Estuary MFLs (2)** ▪ **Operational Planning (1)**
SWFFS Regional Model				**0**	▪ **Lake Okeechobee Sediment Management Feasibility Study (2)** ▪ **Lake Recession Project ( )** ▪ **Lake Okeechobee Water Quality Study (2)** ▪ **SAV study ( )** ▪ **Lake Okeechobee TMDL ( )** ▪ **Regional ASR Study (2)**
SWMM (Storm Water Management Model)			**0.05**	**0.05**	▪ **South West Florida Feasibility Study (2)**
TopRS				**0**	▪ **Water Supply Planning ( )**
UKISS			**0.2**	**0.2**	▪ **C-111 Detention Area ( )** ▪ **C-111 Spreader Canal (2)**
UNET			**0.1**	**0.1**	▪
WAMView			**0.05**	**0.05**	▪ **Operational Planning (1)** ▪ **Pre-processing CERP input data to the SFWMM ( )**
WaSh: UEC Watershed Water Quality Model				**0**	▪ **Big Cypress Basin Watershed Management Plan (2)**
WASP6			**0.02**	**0.02**	▪ **Lake Okeechobee Watershed CERP project (2)**

Model Name	*FTE's Supporting Model Development*	*FTE's Supporting Model Implementation*	*FTE's Supporting Model Application*	*Total FTE's Supporting Model*	*Project Model Supports (Mandate Type)*
WATBAL - AFSIRS			**0.05**	**0.05**	▪ **Indian River Lagoon-S CERP Project (2)** ▪ **UEC BMP program ( )** ▪ **St. Lucie Estuary Pollutant Load Reduction Goal ( )**
West Wellfield MODFLOW model			**0.25**	**0.25**	▪ **C-111 Spreader Canal (2)**
West Wellfield Stochastic model	**0.99**			**0.99**	▪ **Develop LOSA basin demand/runoff input for SFWMM ( )** ▪ **Caloosahatchee Water Supply Planning (3)**
WETFLOW				**0**	▪ **West Wellfield Stochastic Model development ( )** ▪ **West Wellfield operation ( )** ▪ **L-31N seepage control for CERP (2)** ▪ **West Wellfield Permit application ( )**
Wetland Water Quality Model			**0**	**0**	▪ **West Wellfield permit review and operation ( )** ▪ **L-31N seepage control for CERP (2)** ▪ **West Wellfield Permit application ( )**
Total FTE	**14.23**	**17**	**19.44**	**50.67**	

Out of the 14.23 FTEs providing model development services, 6.5 are working on 3 models, namely, the South Florida Water Management Model (3 FTEs), the Regional Simulation Model (2.5 FTEs) and the Natural Systems Model (1 FTE). The remaining 7.73 FTEs are providing development effort towards 13 other models. Significant emphasis is being placed on hydrodynamic models, less emphasis on water quality and ecological models and negligible emphasis on flood mitigation modeling. Some modules of the Regional Simulation Model are under development while other modules are being calibrated. This model is expected to replace the South Florida Water Management Model in 3 – 5 years although it is currently being applied to certain sub regions.

Close to 20 FTEs are involved with the application of 31 of the listed 80 models. This by itself indicates that at least 31 models are actively in use at the District. Contractual help is sometimes solicited to assist with the application of models developed by contractors. The Dynamic Model for Stormwater Treatment Areas is one such example. Fourteen of the 50 models that have no staff assigned to model application have staff assigned to model implementation. An additional 13 of the 50 models have staff assigned to model development only. Twenty-two

models have no staff assigned to model development, model implementation or model application. This begs the question, "Who is responsible for or using these 22 models?"

Support Staffing:

To an extent, the modeling effort is supported by the TRT Division. The bulk of the effort (18.27 of 26 FTEs) within the TRT Division is allocated to the Water Supply (D) Program. The remaining 7.73 FTEs are allocated to activities supporting the CERP (P Program). Table 2 depicts the current distribution of TRT staff to named activities.

Table 2

Project / Activity	*Activity Description*	*Models Supporting Activity*	*# FTE's Supporting Activity*
P Program - CERP			
H&H Modeling	**Southwest Florida Feasibility Study**	**· SWFFS Regional Model**	**1.70**
P124	**Broward Secondary Canals**	**· Broward MODFLOW Model · LECR MODFLOW Model**	**0.14**
P135	**Lake Belt In-Ground Reservoir Technology Pilot**	**· LECR MODFLOW Model · North Miami-Dade MODFLOW Model**	**0.20**
P138	**Acme Basin B Discharge**	**· Combination of: HEC-HMS / HEC-RAS / UNET**	**0.41**
P139	**Strazulla Wetlands**	**· South Palm Beach MODFLOW Model · LECR MODFLOW Model**	**0.30**
P140	**Site I Impoundment**		**0.36**
P141	**West Broward Impoundment WPA**	**· Broward MODFLOW Model · LECR MODFLOW Model**	**0.19**
Pa06	**Water Preserve Area Feasibility Study**		**0.06**
ECB	**?**		**0.06**
Pa03	**Florida Bay Feasibility Study**	**· Environmental Fluid Dynamic Code (EFDC) · Florida Bay Seagrass Community Ecosystem Process Model**	**0.10**
P136	**L-31N Pilot Project**	**· WASH123 · Analytic Element Models (AEM) · SEEP-2D · 3D MODFLOW or MODBRANCH · North Miami-Dade MODFLOW Model · South Miami-Dade MODFLOW Model**	**0.02**

Project / Activity	*Activity Description*	*Models Supporting Activity*	*# FTE's Supporting Activity*
		· LECR MODFLOW Model	
P131	Florida Keys Tidal Restoration		0.05
P112 PIR#2	Decomp		0.13
P129	C-111 Spreader	· FEMWATER123/WASH123 · MODNET · MT3D (Modular Three-Dimensional Transport model) · SEAWAT/SICS· SWMM (Storm Water Management Model) · WASP6 · DMSTA · LECR MODFLOW Model	0.02
P117	North Palm Beach County - Part 1		0.30
P128	Biscayne Bay Coastal Wetlands	· FEMWATER123/WASH123 · TABS/MDS (RMA 10) · Lower East Coast Regional (LECR) MODFLOW Model	0.15
P203 MRT	RECOVER Model Refinement Team		3.54
		P Program Total	7.73
D Program – Water Supply			
Dz07	GIS Support		2.32
Dz08	IT & Web Support		3.83
Dz09	Engineering Technical Support		2.55
Dz10	Technical Publications & Presentations		1.25
Dz99	Program Support		3.51
Df02	LWC S/I/F Model Development & Implementation		3.11
Dj02	Model Maintenance/Model Upgrade		0.25
Dj04	District-wide Modeling Support		0.05
Dj06	Project Operational Planning		0.25
Dp01	WILMA Database		0.50

Project / Activity	*Activity Description*	*Models Supporting Activity*	*# FTE's Supporting Activity*
Dp02	**REG. GW Monitoring Network Enhancements**		**0.65**
		D Program Total	**18.27**
		TOTAL FTE's	**26.00**

Models and Data:

Under contract to USACE and SFWMD, Battelle has identified a number of government agencies (federal, state and local) and universities that are collecting and storing data within the boundaries of the SFWMD. The compatibility of those data sets to CERP is classified in the Battelle report as high, medium or low[1]. Although many sources of data were identified they are not all readily available in a fashion that facilitates ease of use and hence are not being fully utilized.

The data requirements for RECOVER, CERP projects and the supporting models are extensive and immediate for some models. These requirements, though extensive, have in some instances not been formally documented. Subsequently, it is uncertain whether the current networks of data collection sites are optimized to support the modeling community.

Data being collected within the CERP region are stored in many disparate systems from different agencies. These disparate systems, by nature, hinder an optimal approach to managing data.

[1] Battelle, Monitoring Data Inventory in the South Florida Region, August 8, 2002

Because of the many agencies involved in data collection, the philosophy or process used to manage data will vary from agency to agency and vary within an agency from department to department. For CERP to be most effective consistent data management processes must be developed and implemented. For example, today there is no well-defined and documented process to move data from any identified source into the CERP Zone.

Most CERP projects require scientific and engineering modeling support. The models in turn require vast amounts of environmental data to be quality assured, easily accessible and available in a timely manner. Today, delivery of quality assured data in a timely manner to the modeling community is less than optimal. Table 3 lists CERP projects and named models that currently support or will support those projects. This depicts the extensive modeling effort required to support CERP projects and hence the considerable demand for data.

Because of the current state of data and the lack of a cohesive and implemented CERP environmental data management plan, regional modelers expend a tremendous effort on extracting data from disparate databases and pre-processing the data. As a result of this

pre-processing, 'modeling input data sets' are created that also require management. In addition to pre-processed data sets the created post-processed data sets require effective management to be accessible and readily available.

The models themselves vary in scale (regional, sub-regional and project) and discipline. Whereas the regional hydrologic modeling effort is centralized within one division and well supported with staff, the other disciplines are fragmented and lack cohesion.

Undoubtedly the staff providing modeling services is well qualified to do so. The activities for the modeling staff include reviewing data for applicability, completeness, consistency and accuracy. In general the modeling staff is dissatisfied with the availability, sufficiency and quality of the data. Subsequently, more time is allocated to data issues than should be reasonably expected. Some issues identified with data follow:

- Land use / land cover data is not being updated at regular and timely intervals.
- Horizontal and vertical datum migration to more accurate standards is being piecemealed.
- There is no common modeling database. There is a common corporate database (DBHydro) that is used for multiple purposes. Most modelers extract their own hydrometeorologic and water quality data from DBHydro for pre-processing. Biological data is stored in a fragmented fashion in various locations.
- Pre-processed and post-processed datasets from previous model runs are not archived in a central location for ease of access and availability.
- Much of the data used in water quality modeling is collected for other purposes. Hence, the network of data collection stations may not be optimized for modeling use.
- Water quality and ecological models have fewer input data points than hydrologic models. Those fewer data points are widely disbursed. Hence, the quality of the data is very important. The modelers need to expend an extra level of effort to ensure data quality. Some areas of the District, in particular the West Coast, have a dearth of data to support modeling activities.
- There is no data model for biological and ecological data.
- Modelers, data processors and data collectors meet insufficiently to discuss modeling data needs and to plan for such. The data collected in the West Coast region has large time gaps and as a result, a recently developed hydrodynamic model was calibrated without data that included values for a wet or dry season. That in itself makes the calibration of the model suspect.

On the other side of the coin some modeling efforts were started without sufficient thought given to the availability and sufficiency of the data to support the model once developed. The Lake Okeechobee Watershed Phosphorous Transport Model is an

example of insufficient thought given to sufficiency and availability of data prior to engaging the model. The current Lake Okeechobee Division overcame the deficiencies and successfully brought this project to closure. Overall, it is uncertain who is responsible for determining data needs and performing network optimization.

Some efforts have been made over time to increase the quality of scientific and engineering data. Recorder modernization was one such effort. This project is past the originally scheduled completion date and is languishing because of lack of funds. Within EMA more and more emphasis is being placed on quality assurance and quality control (QA/QC). This QA/QC effort has led to an ever-increasing amount of preferred dbkeys, which are the gateway to the best possible data points within DBHydro.

Training and Documentation:

Training for modelers is determined through discussions with their supervisors and documented in their Performance Plans. Training for modelers includes programming languages and other software tools to facilitate model development and application development. Although training is provided the overall training effort is not sufficient.

There is some training on the use of some models. For example, there has been a concerted effort to improve the number of modelers capable of applying the South Florida Water Management Model (SFWMM) through training. However, the number of staff that can currently make complex development changes to that model is severely limited. It is reported that the dearth of modelers often makes it difficult to train other modelers on specific models resulting in a "single person dependency". That describes the situation where only one person knows a model in enough detail to perform maintenance and enhancements to the model. Some efforts to correct this situation has had limited success due to lack of time available for cross-training.

Also, a series of SFWMM training sessions were planned for early fiscal year 2003 but were cancelled indefinitely.

To compound the lack of training, good user and system documentation for models is lacking. Both training and documentation is neglected when modelers are busy. Most of the model documentation that does exist is geared towards information on the purpose and uses of the model. The documentation for the most part is not adequately addressing the design and inner workings of the model. This knowledge is passed from one modeler to another in a tribal fashion. To even further compound the issue, there may be more than one version of the same model in use.

During times of drought and extreme wet events, modelers are tasked with other duties and find little time to train or document. In those times of stress, the 'get it done' attitude forecloses any thought of documentation and/or cross training. The lack of a methodology or set of standards for model development or coding is an obstacle to good documentation.

Upon arriving at the District, new employees face the daunting task of learning custom built models with poor documentation from busy modelers.

Typically, the training required by new employees to properly maintain and support models support cannot be contracted out as the expertise is in-house.

Information Technology:

The position of Director of Information Technology was recently filled. For months there was a void in leadership. There is no current operational Strategic Information Systems Plan (SISP). Most modeling staff and some IT staff believe that the department has been lacking in strong, stable and fair leadership. The funds to support IT initiatives are reportedly low. Support to remote areas such as the Ft. Myers Service Center is poor. The 2 T1 lines that facilitate communications between Ft. Myers and West Palm Beach are inadequate for the vast amounts of data transfer that is periodically required. These 2 T1 lines are also used for voice communication and video conferencing which leaves even less bandwidth for data transfer. For the most part, the modeling groups are the proponents of any IT solutions that would overcome obstacles they face or any performance improvements that can be made.

To augment support provided by the Information Technology Department, the TRT Division provides just over 6 FTEs to IT, Web and GIS support. With adequate support from the centralized department, a portion of these resources could be redirected to other modeling activities.

There is a current movement to migrate models from the UNIX environment to the Linux environment using personal computers. The level of support provided by the centralized IT staff to this migration effort is questionable. Modeling staff is inextricably involved with evaluating the effectiveness of the technology. This represents a diversion of modeling staff time from model development, application development and model application.

The current movement to migrate from the UNIX environment to the Linux environment is not supported by a document outlining the information technology requirements of the modeling community and whether Linux is the most appropriate solution.

Whereas there is an Enterprise Geographic Information Systems Plan, there has been limited funding to support it. Hence, land use data, for example, is 7 years old. GIS data are critical to the modeling efforts and frustration exists about the lack of availability of updated coverages.

Models Supporting Projects:

Over the years models have played an increasingly critical role in providing the District with an understanding of the environment and influencing decisions. In addition to supporting planning decisions, models are being increasingly used to support operational decisions. Models to help with decision making for flood mitigation are lacking. There is no unit developing flood mitigation models. There is insufficient emphasis placed on water quality, ecological and economic modeling.
The CERP Interagency Modeling Center (IMC) is jointly staffed by the USACE and the SFWMD. At this time, it is envisioned that other agencies may also staff the IMC. The modelers staffing the IMC from the USACE will be trained on the use of the models developed by the

District. The responsibilities of the IMC are being discussed as the IMC is still in its formative stages.

A prioritized list of non-CERP projects has not been finalized by the District at this time.

Table 3 below shows the CERP projects and the models required to facilitate timely completion.

Table 3

CERP Project	*Models Identified to Support Project*
Acme Basin B Discharge	• Combination of: HEC-HMS / HEC-RAS / UNET
Allapattah Natural Area Complex	
ASR Regional Study	• Lake Okeechobee Ecosystem Model • Ecological Methyl Mercury Model • Pollutant Fate/Transport Model • Floridian Aquifer Groundwater Model
Biscayne Bay Coastal Wetlands	• FEMWATER123/WASH123 • TABS/MDS (RMA 10) • Lower East Coast Regional (LECR) MODFLOW Model
Broward Secondary Canals	• Broward MODFLOW Model • LECR MODFLOW Model
Broward WPA Projects	• Broward MODFLOW Model • LECR MODFLOW Model
C-111 Spreader	• FEMWATER123/WASH123 • MODNET • MT3D (Modular Three-Dimensional Transport model) • SEAWAT/SICS • SWMM (Storm Water Management Model) • WASP6 • DMSTA • LECR MODFLOW Model
C-17 Back Pumping and Treatment	
C-23/24 North and South Reservoirs	
C-23/24 STA	
C-23/44 STA	
C-25 Reservoir and STA	

CERP Project	*Models Identified to Support Project*
C-43 Basin Storage Reservoir - Part 1	• MIKE SHE • MIKE 11
C-44 East STA	
C-44 Natural Areas (PalMar Complex)	
C-44 West Reservoir and STA	
C-51 and L-8 Reservoir	• Combination of: HEC-HMS / HEC-RAS / UNET • LECR MODFLOW Model • North Palm Beach MODFLOW Model
C-51 Back Pumping and treatment	
Cypress Creek Natural Area Complex	• Pal-Mar Cypress Creek and the Groves Basin Study • LECR MODFLOW Model
Decomp	• Everglades Landscape Fire Model • Everglades Landscape Model • Everglades Landscape Vegetation Model—SAWCAT Module • Everglades Ridge & Slough Model (ERSM) • Everglades Tree Island Model (ETIM)
Everglades Ag. Area Storage Reservoirs (1)	• DMSTA (Dynamic Model for Stormwater Treatment Areas) • Everglades Mercury Cycling Model (E-MCM) • MIKE 11 • MIKE SHE
Florida Bay Feasibility Study	• Environmental Fluid Dynamic Code (EFDC) • Florida Bay Seagrass Community Ecosystem Process Model
Florida Keys Tidal Restoration	
Hillsboro Impoundment	• Broward MODFLOW Model • LECR MODFLOW Model
L. O. Water Retention and P Removal Project	
L-31N Pilot Project	• WASH123 • Analytic Element Models (AEM) • SEEP-2D • 3D MODFLOW or MODBRANCH • North Miami-Dade MODFLOW Model • South Miami-Dade MODFLOW Model • LECR MODFLOW Model
L-8 Basin Modifications	• LECR MODFLOW Model • North Palm Beach MODFLOW Model
Lake Belt In-Ground Technology Pilot Project	• LECR MODFLOW Model • North Miami-Dade MODFLOW Model

CERP Project	*Models Identified to Support Project*
Lake Istokpoga Regulation Schedule Review	
Lake Okeechobee Watershed Project	• EAA BMP Makeup Water Model
Lake Worth Lagoon Restoration	• Environmental Fluid Dynamic Code (EFDC) • LECR MODFLOW Model • North Palm Beach MODFLOW Model
Northfork Floodplain Restoration	
Pal-Mar and J.W. Corbett	• Pal-Mar Cypress Creek and the Groves Basin • LECR MODFLOW Model • North Palm Beach MODFLOW Model
Southwest Florida Feasibility Study	• SWFFS Regional Model • MIKE SHE • MIKE 11 • CH3D (Hydrodynamic Model)
Strazzulla Wetlands	• South Palm Beach MODFLOW Model • LECR MODFLOW Model
WPA Agricultural Reserve Reservoir	
WW Reuse Pilot Project, Part 1	

STRENGTHS AND WEAKNESSES:

The current strengths and weaknesses of the modeling environment are listed in the Table 4 below. The statement in the future needs column is based on the associated weakness and what is currently deemed necessary to overcome the weakness. Future needs will be considered further in the next phase of the Strategic Modeling Plan effort.

Table 4

Strengths	*Weaknesses*	*Future Needs*
TOOLS		
• Regional hydrodynamic models	• Multi-disciplinary models	Multi-disciplinary teams in new organization structure
• Science behind models	• Lack of off-the-shelf models – custom development required	Methodology that examines this issue in the pre-planning phase
• GIS	• Flood control/routing modeling – flood forecasting and mitigation tools	Form Flood Control team
	• Integrated groundwater and surface water models	Develop requirements document

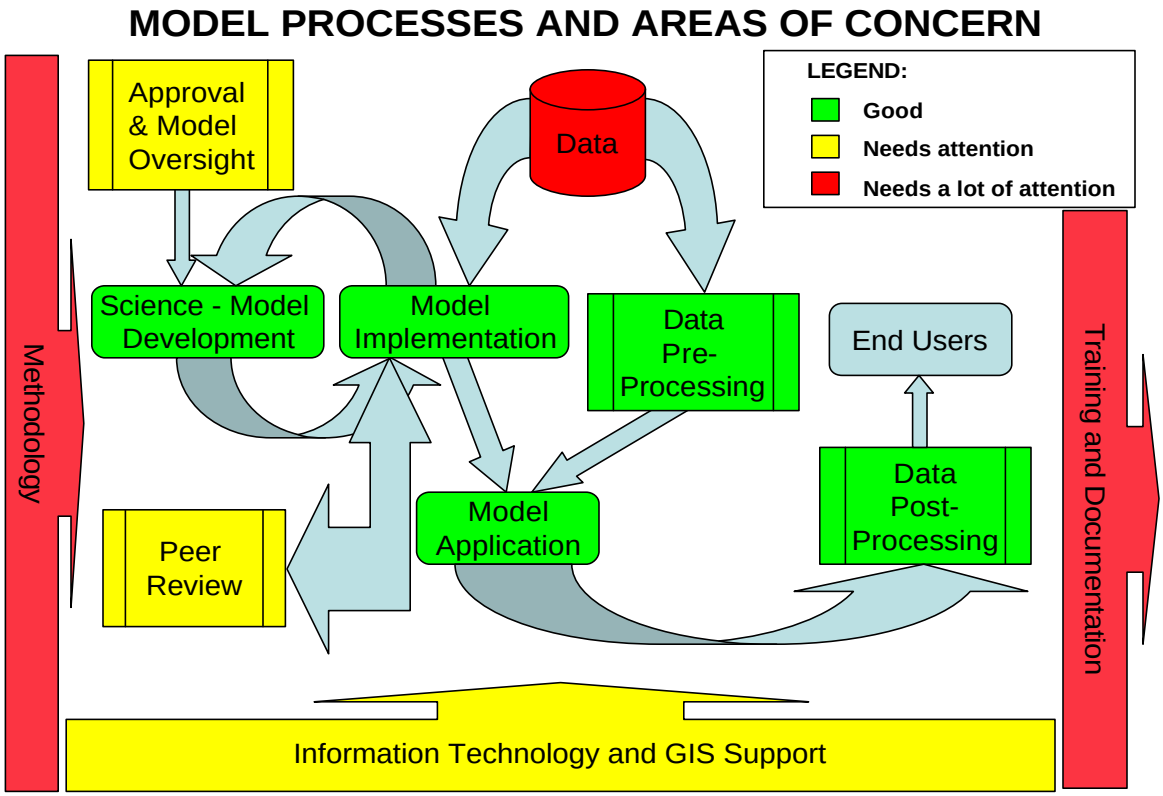
Strengths	***Weaknesses***	***Future Needs***
	• Real-time simulation capability	Develop requirements document
	• Ecological models	Develop requirements document
	• Economic models	Develop requirements document
	• Water quality models	Develop requirements document
	• Consistent estimation of missing values	Adopt methods for estimating different types of data
	• Software QA/QC tools	Methodology
	• Common set of assumptions	Methodology
	• Library of models	Clearinghouse
	• Library of pre and post processed data	Clearinghouse
STAFFING		
• Knowledge of specific disciplines	• Single person dependency	Add and train qualified staff
• Experience with water management	• Divergence of modeling staff to other duties (brush fires, data cleansing, etc.)	New management approach
• Dedication to profession	• Full partnership with USACE	USACE to add staff
• Deliver under pressure		
• Institutional knowledge		
• Technical expertise		
DATA		
• Extensive hydrologic and meteorologic data collection network	• Data Inconsistency	Real-time quality assurance
• USGS contracts to collect water quality, flow, stage, … data	• Deficiencies in data collection/availability	Budget
• DBKeys	• Availability of timely spatial data	Budget
	• Timely data monitoring (should be ahead of modeling)	Methodology that examines this issue in the pre-planning phase
	• Insufficient data to do density dependent groundwater flow models	Data Network Optimization
	• Consistency in horizontal and vertical datum being used	Budget
	• Topographic data	Surveys
	• Archive of pre- and post-processing data	
	• Meta data	Methodology
	• Availability of data from other agencies	Review work by Battelle

Strengths	*Weaknesses*	*Future Needs*
INFORMATION TECHNOLOGY		
• Microwave loop	• Information Technology Support	Leadership
• Local Area Network	• Remote IT support	Leadership
	• Dedicated GIS support	Central Organization
	• Bandwidth to remote areas	Budget / Strategic Plan
	• Inadequate storage capacity	Budget / Strategic Plan
	• Supporting software tools	Requirements document
	• Supporting Hardware	Requirements document
	• Programming support	Staff
	• Software Development Life Cycle	Methodology
PROCESS		
• Model Refinement Team	• Formal modeling process	Methodology
	• Formal peer review for all model development	Methodology
	• Model review criteria guidelines	Methodology
	• Standard methods (e.g. ET computation)	Management
	• Approval of statement of work prior to model development or contract issuance	Methodology
	• Time to develop models	Methodology / Project Plan
	• Formal approach for selecting hardware and software	IT Methodology
	• Software standards	IT Plan
	• Pre-planning	Methodology
	• USACE involvement	
	• Other external agency involvement	
	• Politics	Management
	• Peer Review	
	• Priorities	
	• Modeling proposed before verifying the availability of data	Methodology
	• Criteria for model selection	Methodology
	• Post completion audits (verification of model runs when new data is available)	Methodology

Strengths	*Weaknesses*	*Future Needs*
TRAINING		
	• Documentation of models	Methodology
	• Training on models in use	Training Plan
	• Incorporation of technology transfer and training in all modeling contracts	Procurement
COMMUNICATION/COORDINATION		
	• Modeler/Client interchange (should interview clients more often)	Methodology
	• Communications between different modeling groups	Central Organization
	• Coordination between field work and model development	Management
	• Coordination with Local Governments (Miami-Dade for example)	Management
	• Coordination of data collection and modeling	Methodology
	• Common set of terms and definitions	Glossary
	• Computer scientists working closely with modelers	Central Organization
	• Coordination between monitoring equipment installation and data collection	Management or move ESDA to EMA
	• District Strategic Plan	

SUMMARY OF ASSESSMENT:

At a strategic level, the areas of concern are highlighted in the high-level process chart that follows. Data, the lack of a methodology and inadequate training and documentation is of grave concern to many modelers. The actual science behind modeling is sound. However, the approval to go ahead with model development is at times questionable. The level and applicability of peer review provided prior to the application of models is inconsistent. Information Technology and GIS support for modeling needs improvement.



Modeling plays an important role in the District's resource management decision-making process. This assessment found a number of areas that are satisfactory and others that need improvement. A sense of urgency exists to make improvements where needed due to the large number of priority projects in process or planned that require the use of models. This assessment is the first step in the improvement process. The identified future needs and recommendations, if properly implemented, will during the next 10 years change yellow areas to green and red areas through yellow to green. A dedicated effort is required to also ensure that green areas remain green.

FUTURE NEEDS AND RECOMMENDATIONS:

During the assessment of modeling activities *model development* was defined as comprising:

- Code Development
- Design
- Algorithm Testing
- Documentation

Model implementation was defined as comprising:

- Data set development
- Calibration
- Verification
- Sensitivity analysis
- Reports

Any code development or modification required as a result of model implementation would be considered model development. *Model application* is the repetitive application of a model to a particular project

For the most part a staff member that develops a model is also the same staff member that implements the model and in many instances applies the model.

At a strategic level the assessment tabulated several areas of weaknesses and future needs to mitigate each weakness. The root cause for those weaknesses can be overcome through:

- the adoption and implementation of a good methodology and management's commitment to the **methodology**,
- a better **organization** structure,
- improving the quality, availability and accessibility of **data**,
- improving **information technology and GIS support**, and
- effective use of existing **human resources**.

Methodology:

Recommendation 2 of the Audit of the Hydrologic Modeling Program, System Development Life Cycle conducted by the Office of Inspector General in 2002 stated, "The District should adopt a formal System Development Life Cycle process for model development including design, development, testing, implementation, and maintenance (change management) with all the necessary authorizing documentation (audit trail) for the steps in the process". This recommendation was directed towards the Hydrologic Systems Modeling division, however the finding of this effort is that Recommendation 2 of the audit should apply to all model development at the District. This effort suggests a methodology that incorporates the concepts of the Software Process Framework of the Software Engineering Institute's Capability Maturity Model (CMM). There are 5 maturity levels in CMM. Each level addresses:

- Policies
- Standards
- Processes
- Procedures

Given the visibility of modeling efforts and the potential challenges in court the District's process for model development, implementation and application should be rigorous enough to withstand challenges. One project manager stated "There are conflicts in every step of the modeling process". The District should strive to be at the equivalent of Level 3 of the Capability Maturity Model within 3 years.

Following a sound, industry-accepted methodology such as the CMM will streamline the process of model development, implementation and application. The methodology will facilitate:

- Communications between Project Managers, Clients and Modelers
- Good consistent end to end documentation on models and data used
- More effective code
- More maintainable models
- Necessity of models
- Appropriate tool set used
- Appropriate resources identified to be assigned to project
- Well defined requirements
- Models developed to match the requirements
- Evaluation of alternatives to modeling to the development of sophisticated models.
- Priority setting

The methodology begs for an oversight committee that will ensure that all modeling activities are undertaken from a holistic District perspective. The oversight committee will:

- Ensure proposed models supports District and CERP priorities
- Approve project charters for modeling efforts
- Determine priorities
- Ensure adequate contractual safeguards are in place
- Ensure adequate resources (people, money, hardware and software) are in place
- Ensure that the proposed models are well coordinated and consistent with other efforts
- Ensure consistent application of the methodology

At the barest minimum the proposed oversight committee should comprise; 2-3 members of the executive team and the Director of modeling activities. For models that will be applied to CERP the USACE should be full partners on the oversight committee.

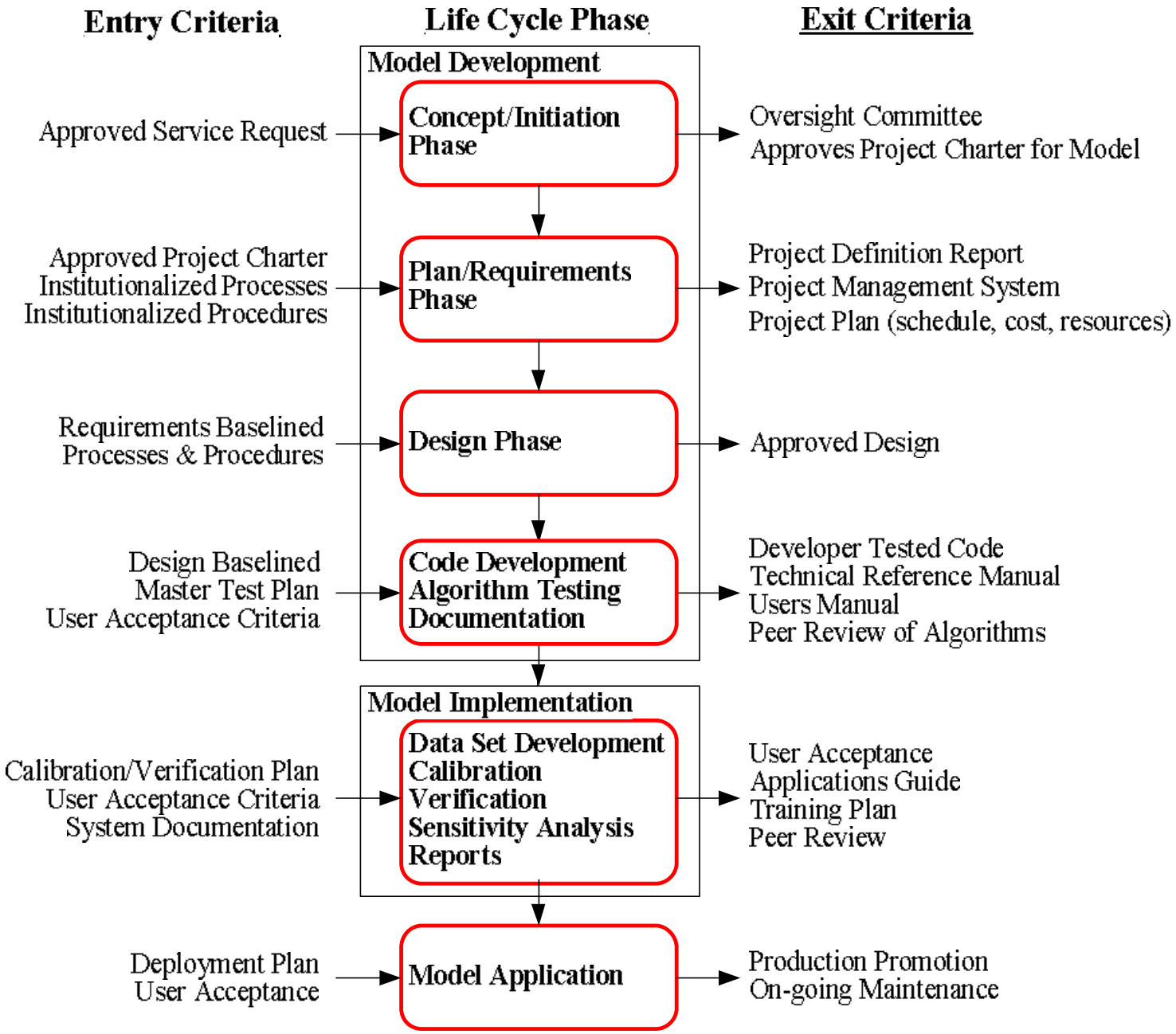
Model development is done without a common set of standards or methodology or review that applies to all. The consequence of such an approach is inconsistent levels of documentation, inconsistent quality of the development effort, and inconsistent processes. Commitment of the executive team is required to embrace the cultural change that will lead to successful implementation of the methodology.

A strong executive sponsor will be required to consistently support the adoption and implementation of the methodology. This executive sponsor will champion the results of the methodology and track the progress being made. The executive sponsor will ensure that the team assigned to the implementation of the methodology is strong and representative of the modeling community.

The development of a communication plan will be an output of implementing a methodology. The communication plan will outline the types and frequencies of communication with stakeholders and users.

At a high level, the life cycle methodology flowchart adopted may resemble the flow depicted on the following page.

Any adopted methodology must be made



applicable to all phases of modeling; development, implementation and application.

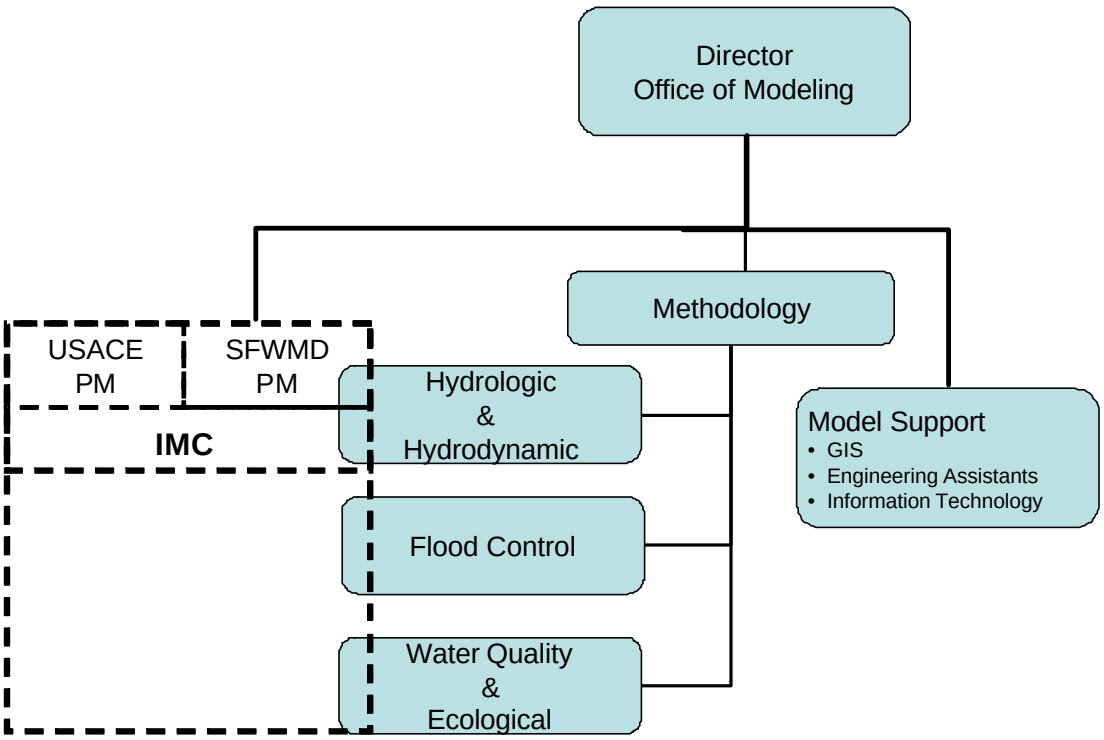
In adopting a development methodology it is also critical to adopt a program to upgrade the capability of staff to function with the methodology. Upgrading staff includes:

- The development and execution of a formal training plan for all modelers
- Proper alignment of staff with modeling functions (development, implementation and application)
- Recruiting software developers to augment modeling staff
- Development of a formal training and mentoring plan for new hires
- An appropriate compensation package to encourage retention of employees

Plato Consulting recommends the District adopt and an implement a methodology consistent with the approach to the Capability Maturity Model. Long term success of the implemented methodology is directly dependent on strong and continued executive management support

Organization:

As noted in the assessment phase, the current organization structure of modeling activities is decentralized. To facilitate the implementation of a methodology, Plato Consulting recommends that some modeling activities be centralized in an Office of Modeling which is separate from any existing department. The functional chart below illustrates the concept. The actual implementation of the Office may differ from what is depicted here.



Plato Consulting recommends the following:

Centralize:

- Library of models (source and executable) including sub regional and project models
- Library of preprocessed data sets used in existing models
- Review of Statement of Works
- Expert peer review of models
- Model development for all types and scale of models
- Implementation of methodology
- Model implementation for regional models
- Model application for regional models

Decentralize:

- Model implementation for non-regional models
- Model application for non-regional models

As mentioned previously staff involved in model development may also be involved in the implementation and application. The development activity however requires rigorous adherence to the methodology. Adherence to the methodology is applicable to model implementation and application. If, as a result of implementation, some code rework is required then that effort should be undertaken with rigorous adherence to the methodology. In addition the methodology must have a procedure or process or criteria to effectively address whether to build or buy a model

The staff performing the tasks of model implementation may be temporarily reassigned from the centralized development group to the applicable implementation area. Formalized training plans should be developed and executed to train other scientists and engineers on model application.

The centralized modeling effort must be shored up with appropriate GIS, engineering assistants and information technology staff. This is not suggesting that the Technology Resource Team move to the modeling group. TRT supports efforts within the Water Supply Department as well as modeling. The District must make a commitment through redirection or other means to appropriately staff the Office of Modeling.

The IMC is still being shaped. However, it is foreseen that there will be 2 co- technical leaders for the IMC; one from the District and the other from the USACE. It is recommended that the SFWMD's Technical Leader report to the Director of the Office of Modeling.

There is no organization structure that will please every modeler. There are structures, however, that will be more effective that the present one. There are often articulated pros and cons for centralization or decentralization.

Model development, implementation and application as a whole lack cohesiveness and lack a strong methodology. A number of issues discussed by modelers such as documentation, training, integration, peer review and prioritization are attributable to the informal process of development. The adoption of a more formal process of model development will alleviate a number of the identified current weaknesses of the modeling environment. The introduction of a formal process of model development

will be assimilated faster in a centralized environment. A decentralized environment may again lack the central oversight powers for a consistent application of the adopted methodology.

The adoption of a methodology should be done with the USACE as full partners in the process. The adopted methodology should apply to all model development, model implementation, model application and contractual efforts. With decentralization, organizational boundaries and differing supervisory approaches may hinder a consistent application of the methodology. The centralization of model efforts may not be forever. A central organization will be better equipped to take on and alleviate the current weaknesses. The structure should be revisited in five or more years to determine its viability for the demands of that time.

Data:

There are several efforts underway to improve the accessibility and availability of data:

- CERP Data Management Plan
- GIS Data Management Plan
- CERP Environmental Data Management Implementation Plan

Holistically, environmental data being collected within the CERP region are stored in many disparate systems. This by itself hinders an optimal approach to managing data. Because of the many agencies involved in data collection, the philosophy or process used to manage data will vary from agency to agency and vary within an agency from department to department. For the modeling process to be most effective a consistent data management process must be developed and implemented.

The Environmental Monitoring and Assessment Department has undertaken an effort to improve and assure the quality of data. Lacking is an effort to ensure that the number and location of data collection points are sufficient for existing and future models. The west coast of Florida is not as data rich as the remainder of the District. Subsequently, a data optimization study is recommended for the west coast. This optimization study must examine the requirements of existing and proposed projects for this region.

Further, Battelle has compiled and published an inventory of all scientific and engineering data pertaining to CERP that is being collected by other agencies (federal, state, regional and local) and universities within the jurisdiction of the SFWMD. This inventory classifies the applicability of the data collected to CERP into 3 categories, namely; high, medium and low. Plato Consulting recommends the District, to the extent possible, develop an agreement with other agencies to receive their data and develop mechanisms to store and make accessible with meta data these other data sets.

Because of the current state of data and the lack of a cohesive and implemented data management plan, regional modelers expend a tremendous effort on extracting data from disparate databases and pre-processing the data. As a result of this pre-processing, 'modeling input data sets' are created that also require management. In addition to pre-processed data sets the created post-

processed data sets require effective management to be accessible and readily available. Plato Consulting recommends the continuation of data management efforts currently underway. The business benefit of these efforts, if implemented, may include the following:

- The establishment of consistent policies and processes for managing data
- The establishment of good data communications plans
- One stop shopping for existing and proposed data
- The cost effective and appropriate assimilation of data to facilitate the following:
  - Storage
  - Integrity
  - Auditability
  - Availability
  - Accessibility
  - Reliability
  - Documentation
  - Security
  - Backup
  - Recovery
  - Flexible architecture to allow for integration of disparate data sources

The purpose of the CERP Quality Assurance for System Requirements (QASR) effort is to develop quality assurance criteria for all disciplines of data. The quality assurance criteria for water quality data are complete. The quality assurance criteria for other disciplines are in various stages of development. Plato Consulting recommends renewed commitment to this effort. With accepted QA criteria modelers will have more time to focus on model development, implementation or application rather than on data issues.

Information Technology and GIS Support:

The weaknesses associated with information technology and GIS support may be overcome with quality leadership, adequate planning and funds to support planned initiatives.

A Chief Information Officer was recently hired by the District. This act fills the leadership vacuum that existed for months. There is no operational strategic information technology plan. As a result, hardware and software is being proposed and selected to support modeling without adequate supporting requirements and without a sense of an overarching direction on IT for the next 2 – 5 years. An example of such proposed hardware is the Linux Cluster and Storage Area Network.

The Information Technology area has not demonstrably advanced a software development methodology life cycle. Plato Consulting recommends that a senior qualified member of the information technology staff play an important role in the adoption and implementation of the methodology to facilitate model development efforts.

It is reported that there is a lack of funding for IT initiatives. Given the most recent absence of leadership and inadequate planning, this action is justified. However, that leaves projects that require proper IT support floundering with antiquated hardware. The IT planning effort must occur immediately in conjunction with District needs and priorities to enable

appropriate funding to realize and facilitate a more effective execution of model development, implementation and application efforts.

To ensure the hardware and software needs of the modeling community are being adequately satisfied Plato Consulting recommends that tasks be undertaken to ascertain and document the requirements of modeling. The following tasks should be considered:

- Identify modeling stakeholders
- Develop stakeholder questionnaires
- Combine responses to questionnaires with interviews and meetings with stakeholders to ensure an understanding of requirements, issues, risks and dependencies.
- Document requirements, issues, risks and dependencies to ensure coordination and compatibility with long term directions
- Use the document as a basis to develop 2 -3 solutions for hardware and software
- Develop a solutions criteria
- Using solutions criteria discuss alternate hardware software solutions
- Using solutions criteria determine the optimal hardware and software solution

Human Resources:

Given the scarcity of human resources, it behooves the District to ensure the model development, implementation and application efforts are properly organized, planned and managed to ensure effectiveness and efficiencies are gained. The implementation of the methodology should ensure that models being developed will have adequate and quality assured data to support the models. With implementation of the methodology, the District should minimize the number of like models being used for a particular discipline. For example, there are 3 existing water quality models that are capable of supporting the same projects. There are 3 water quality models because each organization contracted to perform the modeling tasks did so with their preference for a model. The District should evaluate, document and select appropriate models for use. Every contractor should be required to be familiar with and use the District's models of choice.

The adequacy of human resources should be addressed during the reorganization of modeling efforts. The implementation of a methodology and the distribution of non-modeling tasks to non-modelers will result in more effective use of existing modelers. The level of modeling support provided by staff to projects must be re-evaluated as most efforts are supporting mandate types 2 and 3 rather than mandate type 1 projects. Plato Consulting recommends a detailed assessment of the current duties that modeling staff are assigned to perform. Plato Consulting further recommends that the results of the assessment be used to align staff with District priorities.

CONCLUSION:

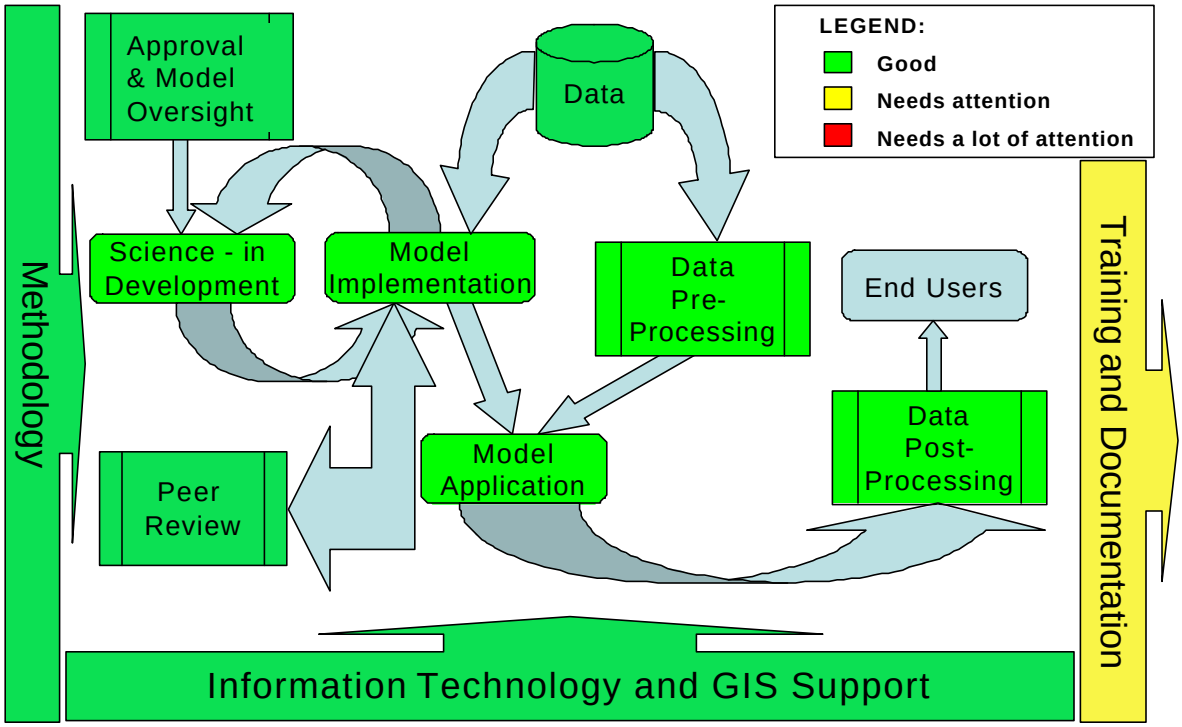
The lack of a District strategic plan and operational information technology strategic plan are constraints on this modeling effort. To mitigate the lack of strategic plan the assessment document identified the projects that models are being used to support. So far, most modeling efforts are supporting mandate type 2 and 3 projects.

With the implementation of a good methodology, management's commitment to the methodology, to data and to IT and GIS efforts the current state of modeling should look like the following in 3 - 5 years. By FY2014 Training and Documentation should be green.

It is not foreseen that documentation on all 81 legacy models will be addressed in the 3-5 year time frame. For a formal training program to be successful adequate documentation must be developed for all models for which training will occur.

To assist with the implementation of the recommendations made in this report a schedule including suggested start and end dates and estimated contractual costs for five fiscal years is attached as Appendix A. Included as Appendix B is a proposed project charter for implementing a methodology. The proposed project charter will assist with facilitating the kick off of the project to adopt and implement a methodology.

A Glimpse of the Future: 3 - 5 Years From Now



IMPLEMENTATION:

The following chart is a summary of the recommendations, proposed start and end dates and estimated 5-year contractual costs:

Strategic Plan Recommendation	*Start Date*	*End Date*	*FY04 Cost*	*FY05 Cost*	*FY06 Cost*	*FY07 Cost*	*FY08 Cost*
Adopt and an implement a methodology consistent with the approach to the Capability Maturity Model. (Page 29)	7/03	9/06	$599,364	$381,575	$34,729	$	$
Centralize model development in an Office of Modeling which is separate from any existing department. (Page 29)	7/03	9/03					
SFWMD's Project Manager for IMC should report to the Director of the Office of Modeling. (Page 30)	7/03	7/03					
Data optimization study for the west coast (Page 31)	10/04	9/05	$0	$250,000			
To the extent possible, develop an agreement with other agencies to receive their data and develop mechanisms to store and make accessible with meta data these other data sets (Page 31)	10/04	9/06					

Strategic Plan Recommendation	*Start Date*	*End Date*	*FY04 Cost*	*FY05 Cost*	*FY06 Cost*	*FY07 Cost*	*FY08 Cost*
Continue data management efforts currently underway. (Page 32)	On-going						
Renewed commitment to the QASR effort. (Page 32)	On-going						
A senior qualified member of the information technology staff plays an important role in the adoption and implementation of the methodology to facilitate model development efforts. (Page 32)	7/03	9/06					
Tasks be undertaken to ascertain and document the requirements of modeling to substantiate hardware and software recommendations. (Page 33)	10/03	3/04	$100,000				
Assess the current duties that modeling staff are assigned to perform. (Page 33)	7/03	9/03					
Align modeling staff with District priorities. (Page 33)	10/03	1/04					
Total							

PROJECT CHARTER:

Executive Summary

- The management team from the SFWMD has become increasing aware of some serious problems that have been affecting the development, implementation, and maintenance of models. They include the ability to: 1) effectively manage model work requests; 2) develop quality models that meet customer requirements and expectations, and 3) develop models on time and within budget.
- The majority of these problems fall into two categories: the lack of a common model development methodology and life cycle; and the lack of common work and project management disciplines, processes and methodologies.
- Some specific problems include the inability to:
    - Prioritize and effectively and consistently manage service requests and work
    - Coordinate overall model development
    - Consistently perform peer reviews of work products
    - Develop model documentation, resulting in difficulty for others to use the models and creating single person dependencies
    - Provide adequate model, software, and project management training
    - Manage project scope
    - Leverage and utilize existing work products and intellectual capital
- After analysis and numerous internal and external discussions, the management team has developed a solution to resolve these problems and improve work management and the results of model development. The solution includes the approval and funding of a project that will provide the:
    - Development and implementation of a web-based service request or work management process
    - Development of a web-based, common methodology and process asset repository of model, software, service request, and project management processes and procedures, utilizing SEI/CMM as a framework for the design

Purpose

- To develop a centralized, web-based 1) work management or service request system and 2) a process asset repository of a common methodology, processes and procedures; which will be utilized by SFWMD for consistent work management, model development, model implementation, model application, and project management.
- To develop an infrastructure that will support the SFWMD and their customers, and improve the overall productivity, quality, documentation, collaboration and communications, and schedule and cost predictability of work management and model development, deployment and maintenance.

- To develop web-based, just-in-time training for the modelers and their customers
- This project charter describes the following project specifics:
    - Benefits
    - Scope / Out of Scope
    - Approach
    - Deliverables
    - Project Completion Criteria
    - Project Origination Chart
    - Roles and Responsibilities
    - Major Milestones and Schedule
    - Assumptions
    - Constraints
    - Dependencies
    - Critical Success Factors
    - Cost, one-time and ongoing
    - Appendices

Benefits

- The benefits of this project include the ability to:
    - Predict, with confidence and accuracy, the cost, schedule and results for each model project
    - Manage service requests, work and staff effectively and efficiently
    - Significantly improve the ability of teams to collaborate and communicate internally and externally
    - Shorten model life-cycle time
    - Improve customer satisfaction
    - Provide organization level policies for model development
    - Ensure the new approach for developing models becomes institutionalized across the SFWMD
    - Improve the ability of the modeling customers to develop, manage, change, and approve their model requirements
    - Provide input to annual employee goals and objectives resulting in a more equitable and consistent approach for annual evaluations
    - Improve employee morale, reduce employee stress and turnover
    - Create a new model for work management for the rest of the SFWMD

In Scope

- Service Request (work management) Process and policy

- Work definitions and categories

- SEI Level 2 processes, procedures, forms, templates, white papers and policies for
  - Requirements Management and Change Control
  - Project Planning
    - Project Definition
    - Life Cycle Methodology
    - Deliverable Definition
    - WBS
    - Estimating
    - Scheduling and Sequencing
    - Resource Identification
    - Budgeting
    - Risk Management
    - Dependency Management
    - Communication Management
    - Project Planning Tools
    - Stakeholder Analysis
  - Project Tracking and Oversight
    - Project Execution
    - Resource Management and Training
    - Financial Management
    - Status Reporting, Progress Measurement, Forecasting
    - Issue and Problem Management
    - Issue Management
    - Project Management and Tracking Tools
    - Team Collaboration and Communication Tools
    - Administrative Close
  - Model Subcontract / Vendor Management (as applicable)
    - Subcontractor Planning and Procurement
    - Subcontractor Selection
    - Subcontractor Management and Administration
  - Model Quality Assurance

        - Quality Planning
        - Quality Assurance Reviews and Reporting
    - Model Configuration Management
        - Configuration Management
- SEI Level 3 processes
    - Organization Process Focus (partial)
        - Process Engineering Group
        - Process Training
        - Measurement Gathering, Analysis and Reporting
        - Process Tools
    - Organization Process Definition (partial)
        - Definitions
        - Web-based Process Asset Repository
        - Process Development
        - Process Tools and Standards
    - Peer Reviews

Out of Scope

- The scope of this project will not include the following Level 3 key process areas and related processes, procedures and policies
    - Organization Process Focus
        - Process Appraisals and Improvement
        - Process Standards
    - Organization Process Definition
        - Methodology
        - Process Asset Architecture and Flow Charts
    - Training Program
    - Integrated Model Management
    - Model Engineering
    - Inter-group Coordination

Approach

- This will be a long-term project extending to the 2nd quarter of FY06. The following activities will be utilized to ensure that the project is successful in delivering the project deliverables
- A strong project sponsor will be responsible for initiating this project, championing it results, and tracking it through to completion. The sponsor will ensure that the strongest persons are assigned to ensure its success and ability to role model and mentor the rest of the organization. The sponsor will be the driver of organization communications and results reporting and identifying the use of new technologies.
- A permanent program office will be established. This initial program office will consist of the project manager, the engineering process group, trainer, technical lead, and technical writer. The project team will be supported by a centralized web-based team room to foster collaboration and communications. The program office will:
    - Coordinate the activities of the project
    - Develop and assist the Technical Working Group
    - Establish and maintain the Process Asset Repository
    - Establish and collect all project measurements
    - Schedule and monitor all process deployment and training
    - Coordinate all project communications
    - Issue project status reports and results
    - Coordinate quality assurance planning and reporting
- A strong, seasoned, project manager will be assigned to plan, execute, control, and close the project utilizing appropriate project management processes and procedures. The project manager will have the overall responsibility for the project's success and manage the Program Office. The PM will function as a visible role model and mentor to the rest of the modeling organization's project managers.
- An assessment of the current organization status will be performed in order to identify the strengths and weaknesses within the organization. In particular, any existing processes and procedures will be identified and nominated as candidates for best practices. This will reduce the expense of developing required process deliverables and contribute to the organization's resistance to change.
- An organization change management plan will be developed in order to minimize the organization's resistance to change and maximize the adoption and adaptation of the new processes and procedures. Included in this change management plan will be the development of a communication plan, which will inform the organization of not only what to expect and the subsequent results, but most importantly, what will be different and what will be the same.

- A technical working group (TWG) will be temporarily established and utilized throughout the project to review and provide feedback on the content, usefulness, and value of each process and procedure. This group will consist of eight strong model and software engineers, project managers, and customers submitting service requests. Their approval will be obtained prior to piloting and deployment of the process assets to the rest of the organization. This group will meet periodically to review work-in-progress and then pilot the completed process assets. They will act as change agents and mentors to the rest of the organization during training and deployment.

- An Engineering Process Group will be established and utilized full-time to plan, design, and develop the majority of project deliverables. This group will perform assessments and gap analysis, and develop the project requirements. They will act as change agents and mentors to the rest of the organization during piloting, training, deployment, and institutionalization of the new process assets and systems.

- A trainer, skilled in web-based training, will be assigned to the project to design and develop web-based, just-in-time training. This trainer will design the project training approach and develop the training plan. The trainer will also act as change agent and mentor to the rest of the modeling organization during training and deployment.

- A Technical Writer, skilled in HTML, will be assigned to the project to plan, design, and develop web-based process assets within the process asset repository. The technical writer will utilize new technology, such as smart documents, to facilitate the development and utilization of the process assets. The Technical Writer will also act as change agent and mentor to the rest of the organization during training and deployment.

- A Technical Lead, skilled in a web-based markup language, will be assigned to the project to provide technical leadership, direction, planning, design, development, testing, and support.

- The majority of all process and procedures will be piloted to the TWG prior to their deployment. This will ensure that the process assets meet the needs of the modeling organization, function as expected, and the deployment and training will be successful.

- Processes, procedures, forms, and templates will be developed utilizing smart document technology to ensure consistency and efficiency in document and content development. Processes and procedures will also be integrated and linked to ensure their efficient utilization by users. Links will include term glossaries, forms, templates, other processes, internal and external subject web sites and white papers, standards and regulations, instructions and help.

- Processes and procedures will be deployed on a web-based repository that will be immediately and continually available for utilization and reference. Included in the repository will be forms and templates, as required. The project utilization of the processes will be tracked and reported by a web-based system.

- Process training will be developed, scheduled, delivered, and tracked by a web-based system. This web-based training will not only reduce the cost of process training, but also allow for continuous just-in-time training and retraining
- In lieu of an expensive formal CMM assessment, the following approach will be substituted to provide management assurance that the goal of achieving CMM Level 2 has been reached:
    - A final gap analysis of the resulting processes and procedures to the CMM requirements as outlined in requirements
    - A report indicating that all users have been trained and they have implemented the processes into their regular work
    - A quality assurance report indicating that the processes are being utilized and are become institutionalized within the organization
    - A measurement report will be developed and issued indicating the continuous achievement of the 6 key process area metric goals

Deliverables

Planning Phase

- Approval of the Program Office Charter
- Establishment of the Program Office, web-based team room and roles and responsibilities
- Project Definition Report, describing the "CMM Level 2 approach" to be utilized to manage this project
- Project management processes and procedures to be utilized to manage and close the project
- Baselined Requirements
- Resource Management Plan
- Change Management Plan
- Communication Plan
- Quality Plan
- Deliverables Definition
- MS Project Plan, with WBS, estimates, assigned resources
- Team Training Plan

- Risk Management Plan
- Baselined Project Budget
- Configuration Management Plan
- Project Tool Standards
- Stakeholder Analysis Plan
- Test Plan
- Pilot Plan
- Deployment and Training Plan
- Technical Working Group Charter, Training Plan and identified members

Design Phase

- Service request system design
- Work definitions and categories
- Process asset repository web design
- Process architecture and flowchart
- Process deployment, training and implementation tracking system design
- Measurement infrastructure design
- Team collaboration and communication design
- Gap analysis of the planned processes and procedures to the CMM Level 2 requirements
- IT technology and tool standard design
- Process development procedure and template
- Process and procedure outlines

Development Phase

- Organization assessment results
- Glossary of terms
- Smart document templates
- Web-based service request system and process
- Web-based, integrated processes, procedures, terms, help, and forms, standards and metrics
- Policies

- Process deployment, training and implementation tracking system
- Measurement infrastructure
- Team collaboration and communication capability
- IT technology and tool standards

Test Phase

- Test results
- User acceptance testing

Pilot Phase

- Pilot results
- Pilot acceptance

Deploy & Train

- Announcement of processes availability
- Announcement of training availability, schedule and status
- Completed implementation and training report

Institutionalize Phase

- Regular quality assurance reports
- Regular process metrics reports

Project Close

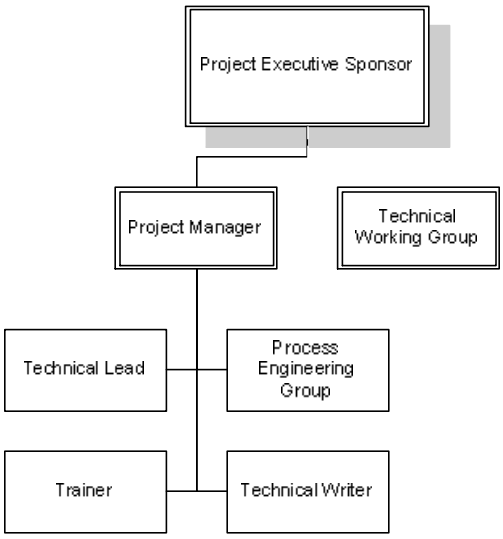
- Lessons learned
- Close out report

Project Completion Criteria

1. The Program Office Charter has been approved
2. The final gap analysis indicates that the processes are CMM level 2 compliant
3. The policies have been communicated to the organization
4. The process asset repository is ready populated and available for organization utilization
5. The service request system is available for organization use
6. The implementation tracking system reports indicate that all users have implemented the processes
7. The process metrics are gathered, analyzed and reported on a regular basis
8. The collaboration team rooms are available

9. Quality assurance reviews indicate that the processes and related policies have been institutionalized

Project Organization Chart



Role	Responsibility
Project Sponsor	• Assign the project manager, members of the EPG, trainer, technical writer, technical support staff • Approve the program office charter, project definition report (PDR) and deliverables definition document (DDD) • Facilitate in the identification of the TWG members • Monitor the project status • Provide support and mentoring to the PM • Define related policies and management metrics • Prioritize requested work • Approve phase-end milestones and authorize implementation of the next project phase • Issue organization communications and announcements • Review quality assurance and measurement reports • Approve project closeout report
Project Manager (1 FTE)	• Develop the program office charter and establish the program office • Initiate, plan, execute, control, and close the project • Develop and distribute regular project status reports utilizing earned value

Role	Responsibility
	• Manage, support, train, and mentor the project team • Define the process to be utilized throughout the project • Prepare project lessons learned and closeout report
Process Engineering Group (EPG) (3 FTEs)	• Participate in an assessment of the current environment and identify existing best practices process assets • Develop a process gap analysis of the required and existing processes • Working with the TWG, develop project requirements, define work definitions and categories • Design the overall web-based architecture • Design the: o process asset repository o deployment, training, and implementation tracking system o measurement infrastructure system o service request system o team collaboration and communication system • Outline the modeling, software, and project management process assets • Develop final process gap analysis of the existing processes to CMM Level 2 requirements • Develop the pilot plan • Mentor the TWG during pilot • Develop the deployment plan • Assist in deployment and training • Implement QA in the Institutionalization Phase
Technical Working Group (TWG) (8 @ .2 FTE)	• Review, pilot, and approve the o project requirements o a) modeling, b) software and c) project management process assets o process asset repository o training materials o deployment, training, and implementation tracking system o measurement reporting system o service request system o collaborative team room system o glossary of common terms o technology and tool standards • Participate in user acceptance testing • Assist in organization deployment and training • Assist in the implement of QA in the Institutionalization Phase

Role	Responsibility
Web-Based Trainer (1 FTE)	• Develop the overall training plan and approach • Develop web-based training for the o Process Engineering Group o process asset repository o service request system o organizational policies o collaborative team room system o measurement reporting system
Technical Writer (1 FTE)	• Design process development standards, templates and smart documents • Design service request standards, templates and smart documents • Create o smart document process templates and forms o web-based processes, procedures, templates, forms, standards, guidelines based on input from the PEG o library standards • Assist in deployment and training
Technical Lead (1 FTE)	• Develop technical project requirements • Design the technology and tool standards • Develop the technical project plan and test plan • Assist in the development of smart documents • Design the web space for the o process asset repository o service request system o deployment, training, and implementation tracking system o measurement reporting system o collaboration team room system • Develop, test, and support the o process asset repository o service request system o deployment, training, and implementation tracking system o measurement reporting system o collaboration team room system • Assist in deploy and training

Major Milestones

Milestone	FTE Effort	Duration Months	District Staff Cost	Contractual Cost
Planning & Requirements Completed	5.4	3	$133,200	$105,084
Design Completed	6.7	4	$201,600	$178,080
Development Completed	7.2	7	$352,800	$358,680
Test Completed	6.1	1	$50,400	$37,716
Pilot Completed	5.6	3	$133,200	$113,148
Deploy & Train Completed	5.9	2	$88,800	$85,008
Institutionalize Completed	4.0	6	$244,800	$64,512
Project Close Completed	0.5	1	$0	$13,440
Total		27	$1,204800	$955,668

Assumptions

- The project will be adequately funded and resources available
- There will be some existing best practices processes available to incorporate into the process asset library
- The organization, including the customer population, is ready and open to change
- New technology will be focused at the enterprise level
- The one-time project Process Engineering Group, Technical Working Group and Technical Lead will be staffed by in-house personnel with an average annual rate of $144,000
- Contractors at hourly rates of $160, $65, and $80 respectively will staff the Project Manager, Technical Writer, and Trainer positions.
- The on-going maintenance activities will be performed by in-house personnel with an average annual rate of $144,000
- The Project Sponsor and the target organization will not charge time to the project budget. This includes time for implementation, training and deployment
- The proposed centralization of modeling activities are implemented

- Institutionalization of the new processes, procedures and methodology will take approximately 6 months, after implementation, training, and deployment has been completed

Dependencies

- Web-based technology that allows for a common project team room and collaboration
- Web-based technology that allows for the development of a centralized process asset repository
- Availability of the Technical Working Group

Critical Success Factors

- A strong and committed project sponsor who will champion the project and its results and be instrumental in resolving issues with external organizations
- The project team cannot be reassigned to put out fires in the middle of the project
- Project buy-in and support must exist at all levels of management
- A seasoned project manager must be assigned with some experience with CMM, the ability to manage the project at CMM Level 2, and be an exceptional communicator
- The strongest project managers and modelers are assigned to the EPG
- Conscious effort, review of project results, and periodic reinforcement provided by senior management
- The development and implementation of a robust project communication plan, organization change management plan, and quality plan
- Development of a common vocabulary
- Making the project fun and including the involvement of everyone within the SFWMD modeling groups
- Senior management should have a basic understanding of model life cycle methodology and the related roles and responsibilities

Constraints

- There is no current operational IT plan to utilize for defining the SFWMD organizations technology and tool standards. Consequently, this project will provide a technology plan, based on the current modeling needs and forward it to the IT Organization for inclusion in its IT planning initiative.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Consider changing the title of the position proposed to head the IMC from Project Manager to another name. The change will avoid confusion with the usage of that title within CERP	Will do. SFWMD will determine appropriate title.
Write a memo to be signed by the Executive Director to implement the strategic plan	SFWMD will do.
To assess the modeling commitment by the District it would be ideal to separately categorize the CERP and District modeling in the tables presented, then provide a summary table.	Some models used for District projects are also used for CERP projects. Additional time and money will be required to separately categorize modeling.
For CERP modeling, a description of the roles played by the various project sub teams, contracted personnel and consultants could clarify the process of model selection, development, implementation and application. Perhaps a section could be dedicated to the interaction & communication when outside personnel are involved. This would also include a section on the Interagency Modeling Center.	This activity will be addressed with the adoption and implementation of a methodology.
As I pointed out in earlier comments, the Life Cycle Phase on Page 28 should be broken out to address implementation and application in more detail since these processes take on a life of their own.	The methodology, if implemented, will address details of development, implementation and application.
On page 3, reference to the Model User Group is good, but you should mention the Model Working Group and GIS Working Group (papers and presentations that I sent you for review were developed by these groups).	Mentioning these groups presupposes that the adopted methodology must support and encumber them. The process of adopting and implementing the methodology will ferret out the appropriateness of existing groups.
On page 2, the statement dealing with support provided to modeling by TRT includes CERP and District modeling and should emphasize "if models address Water Supply issues".	Cannot ascertain what statement on page 2 is being referenced.

Comments on Draft Strategic Plan	*Plato Consulting Response*
There are many GIS, IT, and technical support staff throughout the District. A review of the number of staff and their current duties and how they might be utilized most efficiently would be appropriate for a strategic plan. TRT is a small concentration of the total number, and has the ability to form teams that are a blend of skill areas to address tasks assigned. TRT also keeps in mind that in general most models have common requirements and where possible our solutions are generic so that application can be utilized in multiple areas.	Good recommendation for an IT Strategic Plan. The modeling plan mentions the need for adequate support.
In the IT section, network architecture between District, CERP Zone and IMC should be addressed. This is core to the way we will do business in the future. Close to $1 million dollars in costs are projected to provide IMC with a separate network and computing HW/SW, while the CERP Zone has already spent a high dollar figure for configuring existing capabilities. Also the future location of the IMC should be discussed and IT planned for.	Network architecture should be addressed in an IT strategic plan. The future location of the IMC is being addressed elsewhere.
Mention should be made of the current efforts underway to develop separate "DBKEYS" for modeling. The progress has been good, but funding for periodic updates and areas outside of the current focus (such as SW and Kissimmee) need to be addressed. Also funding to convert hydrologic data values to the Vert88 Datum should be emphasized. This is a huge issue for modeling and standard conversion utilities and methodology should be discussed in more detail.	Mention was made that the District should continue its existing data improvement efforts.
In general, a Vision statement and Goals in 5, 10... years in those areas that need attention stated up front would be a good way to start. Then lead the reader in a way that maps how the visions and goals could be accomplished.	This appears to be an issue of style.

Comments on Draft Strategic Plan	*Plato Consulting Response*
I have been reading the document. One thing that caught my attention is the diagram on page 25. The "good" things are in green and the "needs a lot of attention" things are in red. We need to make sure that whatever plan we implement we do not make the greens become reds because we are trying to fix the reds. We have received a good deal of comments from staff in the North and South Departments speaking to what they think works in the green areas and I believe their comments are centered around concerns that by fixing the reds with the recommendations in this report we will severely break the greens. My 2 cents.	Based on acceptance and implementation of the recommendations, the diagram should gradually move to green in 10 years. Modeling activities should be regularly monitored and course corrections made to ensure a continued green state. Ongoing monitoring is required to ensure that the green sections remain green and do not slip to yellow or red.

Comments on Draft Strategic Plan	*Plato Consulting Response*
The Strategic Modeling Plan cites lack of a consistent model development methodology, inadequate training, and inadequate model documentation as hindrances to District modeling efforts. It also states that these problems are remedied with a commitment by management to institutionalize necessary procedures and by consolidating all model development activities into a single organizational unit (among other recommendations). While the plan demonstrates how commitment by management will help alleviate these problems, it does not show convincingly how centralized development activities will do so. For example, the plan states "A central organization will be better equipped to take on and alleviate the current weaknesses." However, no concrete examples are provided to back up this statement. Given that several divisions (e.g. Okeechobee, HSM, Everglades) have successfully developed and used models, one gets the impression that a number of organizational structures can successfully support modeling programs, if management at the appropriate organizational level is committed providing adequate support.	"The adoption of a more formal process of model development will alleviate a number of the identified current weaknesses of the modeling environment. The introduction of a formal process of model development will be assimilated faster in a centralized environment. A decentralized environment may again lack the central oversight powers for a consistent application of the adopted methodology." Page 30-31 The adopted methodology should apply to all model development, model implementation, model application and contractual efforts. "With decentralization, organizational boundaries and differing supervisory approaches may hinder a consistent application of the methodology. The centralization of model efforts may not be forever. A central organization will be better equipped to take on and alleviate the current weaknesses. The structure should be revisited in five or more years to determine its viability for the demands of that time." Page 31
Prior to its recommendation for reorganizing modeling activities at the District, the Strategic Modeling Plan does not examine alternative scenarios. Rather, the Plan cites flaws with the current modeling approach and proposes a single alternative, which it states will remedy those flaws. Alternative scenarios should be examined.	Alternative scenarios were addressed in meetings.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Possible alternative scenarios that could have been examined include: (1) no change in modeling strategy; (2) create an Office of Modeling to enforce model development/application standards, but keep all modeling activities where they currently reside; (3) create an Office of Modeling to enforce model development/application standards and carry out all model development activities (approach recommended by Strategic Modeling Plan); (4) create an Office of Modeling to enforce model development/application standards, and decentralize all modeling activities; and (5) create an Office of Modeling to enforce model development/application standards and carry out all model development/application activities. Within the context of District modeling objectives, the strengths and weakness of alternatives chosen for review should be examined, and based on this examination, a final decision made.	
In Table 4, very few strong points are associated the District's current modeling approach, relative to the number of listed weaknesses. Given the District's reliance on modeling, one would think more strong points exist. Also, the report does not consider whether the listed strong points will be realized by the recommended approach, and weaknesses associated with the recommended approach are not examined.	The strengths and weaknesses document was compiled and submitted multiple times to the modeling community for feedback. Feedback received was incorporated in the document. In addition, the future need associated with each weakness reflects an examination.
The Strategic Modeling Plan also can benefit by examining other organizations that are heavily involved in modeling activities. Examples of such organizations include Haested Methods, the U.S. Army Corps of Engineers' Waterways Experimental Station, the U.S. Army Corps of Engineers' Hydrologic Engineering Center, the Danish Hydraulics Institute, the Delft Hydraulics Institute, Sogreah Consultants, the Iowa Institute of Hydraulic Research, and ESRI.	This is outside the scope of work.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Without looking at other potential candidates, the Strategic Modeling Plan recommends using the Capability Maturity Model as a software process framework. A group of candidate frameworks should be considered, with their strengths and weaknesses examined. If possible, lessons learned from organizations which have used these frameworks can be analyzed. Preferably, these organizations develop and use hydrologic, water quality, and ecologic models, similar to the District.	The recommendation reads as follows. "Plato Consulting recommends the District adopt and an implement a methodology consistent with the approach to the Capability Maturity Model." Page 29. The selection, adoption and implementation of a methodology are outside the scope of this effort.
The recommended approach does not consider employees who conduct both model development and non-modeling activities. What happens to them? Will they go into the Office of Modeling and discontinue non-modeling activities, or stay where they are and cease model development? If the later occurs, who takes over their work, assuming sufficient resources are available in the Office of Modeling to do so. Not allowing an employee to conduct both modeling and non-modeling activities is a poor use of resources, especially if one activity benefits from the other.	This is an issue that must be considered during implementation.

Comments on Draft Strategic Plan	*Plato Consulting Response*
If the recommended approach is implemented, Divisions that currently develop models to fulfill their mission will have to rely on the Office of Modeling for future development. This will create a situation in which the Office of Modeling has insufficient resources to meet all requests that come its way, and Divisions will not get the resources they need in the time frame required for satisfactory project completion. In other words, a dependency will be forced on Divisions that currently conduct model development activities, and these Divisions will have no control over the dependency. The flexibility that is now available with regards to scheduling model development and implementation will be lost. This type of problem is illustrated with the Technology Resource Team Division, which lacks sufficient resources to meet many service requests.	If the Office of Modeling has insufficient resources to perform prioritized and accepted modeling activities, then management must address the issue by adding resources or only approving modeling activities that the office can develop. If centralization leads to an insufficiency of resources, then an insufficiency should exist with the current structure. Management must address this issue. "Plato Consulting recommends a detailed assessment of the current duties that modeling staff are assigned to perform. Plato Consulting further recommends that the results of the assessment be used to align staff with District priorities." Page 33.
If the recommended approach is implemented, interactions currently experienced by model developers and scientists at the Division level will be lost. These interactions are very important with regards to ensuring that chemical and biological processes are correctly represented. An example is development of an aquatic vegetation module for the Lake Okeechobee hydrodynamics and water quality model, in which limnologists are heavily involved. With transference of model development to an Office of Modeling, this interaction will be lost and a less accurate model will result (if development efforts don't cease all together).	To clarify: non-regional model implementation and application will continue to be distributed. The distributed activities for non-regional models include: data set development, calibration, verification, sensitivity analysis and peer reviews. Substantial interaction occurs during model implementation. Centralized development activities include: code development, design and algorithm testing. This centralization does not preclude interaction amongst stakeholders. Centralization does not equate to loss of interactions and/or to less accurate model results.

Comments on Draft Strategic Plan	*Plato Consulting Response*
The recommended approach will hinder, if not eliminate, interactions between modelers and staff in different organizational units that share common goals. For example, modelers in the Okeechobee Division and staff at the Okeechobee Service Center have worked effectively with one another for a number of years. This relationship is due to common organizational interests, and would not exist if modelers were in a centralized group. Such a group, which only interacts with another group when providing a highly specialized service, cannot encourage the diversity of interactions that exist under the present organizational structure.	Please see previous response.
The recommended approach will reduce effective interactions between modeling and data collection staff. With staff in the same organizational unit, interaction and information exchange are optimal, due to closer organizational and physical proximity.	For the most part the District's modeling staff is currently separated from the data collection staff.
The recommended approach, if implemented, will cause significant disruption to many on-going modeling activities, due to impacts associated with previous observations. Disruptions range from a delay in project completion to termination of projects all together.	The adoption of a methodology should not be retroactive to projects that are significantly underway. The implementation of the organization structure should be such that ongoing projects are not impacted – that disruptions are minimized. The implementation should consider moving necessary staff to the centralized area at an appropriate time.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Implementation of a standard methodology for model development, if done improperly, will create a very rigid framework which actually hinders model development. A standard methodology should recognize that different individuals may take different approaches to model development, and still have successful results. The methodology needs to account for this diversity of talent. Also, individuals who serve on the project review committee should be modelers, because they have the best understanding of problems encountered during development and impleme ntation. The committee should be viewed as a tool to help move projects along, not create unreasonable restrictions.	It is the District's intent to properly implement the methodology. This is the Executive Sponsor's responsibility. The District should consider this input if and when teams are being formed.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Although examination of other organizational structures is recommended prior to making any changes, an alternative to the Strategic Modeling Plan's recommended approach is given below. While addressing current problems, the alternative approach causes less disruption to District modeling activities. The alternative approach leaves modelers in their present organizational units and creates an Office of Modeling that oversees development of and adherence to modeling standards. The Office will organize and facilitate the activities of a committee to develop modeling standards. The committee will be chaired by the Office's director (or a designate) and comprised of modelers from throughout the District. Once the standards are completed, this committee will be dissolved, but the Office shall convene and chair subsequent committees at regular intervals to reexamine and possibly modify the modeling standards. The Office of Modeling also will organize and facilitate the activities of an on-going committee to oversee adherence to modeling standards, which is different from the other two committees. This committee will be chaired by the Office's director (or a designate) and consist of modelers from throughout the District on a rotating basis. Term of service on the committee should not be too long (e.g. one year), to ensure that committee work does not unfavorably impact a modeler's other assignments. Modelers can serve multiple, but not consecutive, terms. The committee will provide oversight for all modeling projects to ensure standards are met. The Office of Modeling also can facilitate interactions among the modeling community by sponsoring presentations, seminars, forums, and conferences.	The implementation approach must give serious thought to any potential disruptions and how to mitigate those disruptions.

Comments on Draft Strategic Plan	*Plato Consulting Response*
While we can agree to disagree, Todd makes many good points about how the current structure serves the needs of the Lake Okeechobee Protection Program (which is more than a single division/department) very well, and the proposed alternative will not. From personal experience with centralizing key functions (GIS, TRT, Budget) I find that I am continually having to recreate the support I lost through centralization. The reality is that centralization has worked to the benefit of few, not all.	This is a cultural and management issue that current executive management must resolve.
On page 1, the Strategic Modeling Plan refers to a District white paper, "The Future of Modeling at the SFWMD." Who authored this paper and who provided input to its recommendations? Does the paper present opinions of all modeling staff, or just a few?	The authors and participants were: 1. Mark Belknap 2. Tom Fontaine 3. Bob Hamrick 4. Emily Hopkins 5. Victor Kelson 6. Kent Loftin 7. Rick Miessau 8. Jayantha Obeysekera 9. Dan Sheer 10. Robb Startzman 11. Todd Tisdale 12. Joel VanArman 13. Randy VanZee 14. Jason Yan

Comments on Draft Strategic Plan	*Plato Consulting Response*
On page 3, the Strategic Modeling Plan states that modelers outside of HSM ". . . lack a model-specific vision that might account for the seemingly disjointed modeling efforts." Although they may not specifically mention modeling, other Divisions' mission statements still provide adequate direction. For example, the Okeechobee Division's mission ". . . is to protect and enhance the resources of Lake Okeechobee and its surrounding watershed by integrating research, planning, regulation, and engineering activities, and to ensure that these efforts are well coordinated toward achieving water quality, water quantity, flood protection, and environmental restoration project goals." Within the context of this statement, the development and application of modeling tools are an important component of divisional activities. Further, an integral part of modeling is the high level of interaction that occurs between modelers, scientists, and engineers.	Centralization of development efforts does not preclude interaction between modelers, scientists and engineers. All non-regional model implementation and application efforts will remain distributed.
On page 4, the Strategic Modeling Plan refers to a "mandate type (1, 2, or 3)," but does not provides a definition or description.	This is a District term used in the budget process.
In Table 1, the "Project Model Supports" entry is incorrect for the South Florida Nonpoint Source Pollution (SFNPS) Model.	What is the correct entry? This document was circulated for comments and feedback before being incorporated into the draft plan. Corrections to inaccuracies will be appreciated.
On page 13, the Strategic Modeling Plan states that 22 of the models listed in Table 1 have no staff assigned to them and raises the question of use. It's quite possible that these models were used in the past and are simply kept on hand for possible use in future projects. The party responsible for a model likely is the individual who supplied the information.	It is possible. This possibility does not invalidate the question of use.

Comments on Draft Strategic Plan	*Plato Consulting Response*
On page 16, the Strategic Modeling Plan states that development of the Lake Okeechobee Watershed Phosphorus Transport Model ". . . is an example of insufficient thought given to sufficiency and availability of data prior to engaging the model." This statement does an injustice to the Lake Okeechobee Division by not stating that (1) model development was initiated over 12 years ago prior to creation of the Division and (2) Division staff who inherited management responsibilities for the project (after the Division was formed) successfully brought it to closure.	Mention will be made in the Plan that the current Okeechobee Division brought this project to successful closure.
Many of the weaknesses listed in Table 4 are not weakness in Divisions that have rigorous model development programs. For example, the Lake Okeechobee Division (1) is developing and using hydrodynamic, hydrologic, water quality, and ecological models; (2) has models peer-reviewed; (3) uses standard modeling techniques; (4) conducts post completion audits; (4) maintains modeler/client interaction; (5) coordinates field work and model development; (6) coordinates data collection and modeling; and (7) has scientists working closely with modelers. The Division also has developed data models for biologic/ecologic data and data transfer protocols with meta-data.	The weaknesses in the report are from a District perspective. The Lake Okeechobee Division should be commended for its efforts.
On page 26, the Strategic Modeling Plan quotes a project manager as saying "There are conflicts in every step of the modeling process." This statement is used to demonstrate problems with model development. However, no context was provided for this statement. Was the project manager discussing a particular project? If so, was a model being developed under contract or in-house? If under contract, did the original contract specify all contractor and District responsibilities? Was code development involved? Was the project manager relying on products from other projects (e.g. data collection) managed by other individuals in other units? Specific examples should have been cited to back up the statement. Without these examples, the true nature of the problem and relevance to the issue under discussion aren't known.	The statement was made. "Every step of the modeling process" was interpreted to mean "every step of the modeling process".

Comments on Draft Strategic Plan	*Plato Consulting Response*
On page 28, the Strategic Modeling Plan presents a life cycle methodology flowchart. The flowchart should include an analysis phase, during which a better understanding of the prototype system is developed, and a decommissioning phase, in which use of the model is phased-out while a newer technology is brought on-line. The flow chart also should have a model maintenance phase, when upgrades are made to algorithms as new scientific information and computational technologies become available.	Model application includes maintenance. These points should be fleshed out during the adoption and implementation of a methodology.
On page 30, the Strategic Modeling Plan states "The introduction of a formal process of model development will be assimilated faster in a centralized environment. A decentralized environment may again lack the central oversight powers for a consistent application of the adopted methodology." The proposed alternative (given at the end of the General Comments section) to the Strategic Modeling Plan's recommended approach will accomplish these same goals with much less disruption to District activities.	Please see previous comments about disruptions.
On page B-1, the Strategic Modeling Plan identifies model development problems at the District. However, these problems are not unique to the current organizational structure and can occur just as easily under the recommended approach. Only a commitment by management to institute common development and application methodologies will resolve existing problems. These methodologies must ensure the development of quality products and have sufficient flexibility to accommodate different modeling styles. Flexibility enables each modeler to complete projects in a manner most efficient for him or her.	The plan suggests strong management commitment. In response to the statement, "Flexibility enables each modeler to complete projects in a manner most efficient for **him or her**", projects should be completed in a manner most effective and efficient for the **District** and not necessarily for an individual.

Comments on Draft Strategic Plan	*Plato Consulting Response*
On page B2, the Strategic Modeling Plan lists benefits of the recommended approach. However, these benefits are not unique to this approach and can be realized by a number of alternatives. Several examples to support this statement are provided in earlier comments. Again, commitment by management to support modeling activities is most important, regardless of the organizational structure.	Please see previous responses.
There are some unique aspects to ecological model development within the Everglades Division. Our model development efforts are very closely tied to Everglades research. The ecological models integrate most, if not all, of the research projects within the Division. It is extremely important that this close link between ongoing research and ecological model development be maintained as the Strategic Modeling Plan is implemented.	It is important to ensure continued linkages and cooperation.

Comments on Draft Strategic Plan	*Plato Consulting Response*
It is a good idea to develop a mechanism to provide a common environment for modeling at the District – i.e., the Office of Modeling. However, the proposed Strategic Modeling Plan tends to focus on centralizing code development (and other methods), while disrupting the strong science-based focus of some of the ecological modeling programs. One of the most debilitating roadblocks that District modeling programs face involves the sparse inter-group communication associated with methods and critical data. Rather than focus primarily on a standardized software engineering concept, a centralization scheme should provide the common framework for modelers of varying disciplines to collaborate and share (i.e., standardize) methods and data – as determined by the Office of Modeling and the distributed modeling groups. *Under a revised implementation of the Strategic Plan, the Office of Modeling would* a) develop/refine computing methods and codes that are generally common to multiple models and/or that are necessary for direct integration of model codes; b) develop and maintain spatial and temporal data products that are generally common to multiple models; c) provide an advanced technological framework for communication among modeler agents (modelers distributed across District Departments); d) facilitate the documentation, peer review, and selection of models to ensure consistency; e) develop and maintain an advanced computing environment.	Please see previous comments on disruptions.
The Office of Modeling should not condense modelers, irrespective of model and science objectives, into a single organizational group. Some science-based modeling programs (such as the ELM in Everglades Division) are highly successful in the current mode of dynamic feedbacks among field- and model- oriented scientists. *Implementation of a Strategic Plan should ensure that this science-based modeling success continues.*	For clarification purposes: non-regional model implementation and application remains distributed. Model development and regional model implementation and application are centralized.

Comments on Draft Strategic Plan	***Plato Consulting Response***
The computer code that guides the user and "crunches" the numbers in a model is obviously important. A management paradigm that emulates commercial software development – such as proposed in the Strategic Modeling Plan – could be useful in creating multiple, state-of-the-art modeling software packages for widespread application by a large number of users. With enough money, the SFWMD could become a national contributor towards the advancement of simulation models. However, this may not be the most urgent need in District modeling. The "software" end can be just the tip of the model-iceberg. Judging from the report and from experience in Everglades Division, it does not appear that the "software" development process is the current Achilles' heel of modeling at the District. A truly critical component of model development and implementation is the process of data acquisition and synthesis. This appears to be a problem for many District modelers, and one that deserves high-priority focus from a centralization perspective. A centralized Office of Modeling is a useful concept that could simplify (and thus accelerate) model development, implementation, and application. If it were done "right". The focus of the centralization should be to develop, test, and communicate methods and data that would be used as needed by a distributed set of modelers. *Rather than large scale centralization, the focus of the Strategic Plan should be on those methods and data that are truly* ***similar, or commonly shared among District models****.* Particularly in the Northern & Southern Restoration Departments, there are modelers distributed in various key science programs. Under our proposed variant on the Strategic Plan, these distributed modeler "agents" would continue to provide key feedback and information to their local Department/Division organizations, but would be facilitated and empowered by the IT-driven, advanced communication paradigms established by the central "node" of the Office of Modeling.	The plan pointed out 3 areas in need of **a lot** of attention red areas: 1. Data 2. Methodology 3. Training and Documentation In addition the plan pointed out 3 areas that needed attention yellow areas: 1. Approval and Model Oversight 2. Peer Review 3. Information Technology and GIS support The plan does not mention code development or software as the current Achilles' heel of modeling. Data is a critical area. A number of issues pertaining to data are being addressed elsewhere in the District.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Overall Similarities: There is a large variety of simulation models in the science and engineering fields, with that diversity reflected in modeling across the District. Nevertheless, models at the District have some common characteristics, in that they generally should have: 1) a useful level of predictive certainty; 2) acceptance after open peer review. 3) useful documentation; 4) efficient & understandable code; 5) transparent (& rapid) communication of model results; 6) fast & reliable computational infrastructure; 7) efficient input/output data infrastructure	Good information.
Objective-dependent Similarities: It becomes more difficult to generalize across all models as one considers further details that tend to depend on the model objectives. However, there are many instances of District models that have: 1) shared/similar input data; 2) shared/similar algorithms; 3) shared/similar post-processing and web-posting code; 4) linkages among models 5) similar client/project expectations	Good information.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Objective-dependent Dissimilarities: While District models have many shared characteristics, there remain important distinctions among models that vary according to the mandate, and how the model addresses that mandate. The purposes of these comments on the Strategic Plan do not necessitate a description of the types of distinctions that could be made among models. *But the degree to which science programs are integrated with some models is important to the Strategic Plan.* Depending on the definition of "regional" vs. "subregional" models, the proposed (6/6/03) Strategic Plan will centralize some modelers away from their current science-based organizational units. It appears that more consideration should be given to the current interdependence of these modelers with key science programs in the District. *For many of our mandates (such as those associated with CERP), "sound science" is a paramount criterion* in determining how models are selected and used. Furthermore, for some key District models, the field/lab science is tightly integrated with the science of model development and implementation. This is an overall enterprise that requires the direct interaction and collaboration among field and modeling scientists who are familiar with the system of interest. Separate these groups, and you've broken the power and efficiency of the scientific process. A good simulation model is one that is continually updated as new information is acquired through this *direct scientific collaboration - it is a process that advances our system knowledge, giving us much better watershed management capabilities*.	The implementation must ensure continued integration of science programs and models.

Comments on Draft Strategic Plan	*Plato Consulting Response*
Office of Modeling Responsibilities: 1) *Algorithms*: a) develop new or refine existing algorithms that are common to multiple models; b) maintain version control system of algorithm (and associated code) library for Internal access; c) *serve as communication center for modeler agents* 2) *Data*: a) QA/QC shared data; b) develop synthesis (spatial, temporal) of shared data at multiple scales; c) maintain databases and geodatabases of shared data; d) ensure model output data available to other modelers e) *serve as communication center for modeler agents* 3) *Code development*: a) assist modeler agents in developing and adhering to minimal code specifications, especially in anticipation of integrating model codes; b) programming resource for specialized needs of modeler agents; c) enter code products into library of algorithms as appropriate 4) *Documentation*: a) provide conceptual plan and software framework for developing and maintaining documentation relevant to all models; b) maintain version control system of documentation for Internal and External access 5) *Peer review*: a) maintain standards for peer review SOW; b) organize peer reviews for consistency 6) *Post-processing & Web-posting*: a) maintain full code sets or libraries for automated spatial and non-spatial post-processing; b) maintain web site(s) for Internal and External distribution of model results 7) *Uncertainty*: a) develop and test statistical methods; b) develop and disseminate uncertainty-estimating code modules or post-processors for models of varying complexity 8) *Computing infrastructure*: a) ensure availability of high-end cpu clusters, network(s), file systems for multiple modeling needs; b) ensure availability of software as needed for modeler agents	This suggests that more activities than what is proposed in the plan should be the responsibility of the Office of Modeling. The Quality Assurance Systems Requirements (QASR) program is in process of developing QA criteria for all disciplines of data. The QA/QC function should be the responsibility of a Data Management group that serves quality assured data to modelers in a timely manner. The computing infrastructure is the responsibility of the Information Technology Department. That department must be proactive in satisfying the needs/requirements of modelers.

Comments on Draft Strategic Plan	*Plato Consulting Response*
ELM info: The ELM (Everglades Landscape Model) was mentioned as an example in above comments. Some attributes of ELM follow. • *Scale*: a) Regional: greater Everglades (at 1000 m grid scale) b) Basin: WCA-2A (at 500 m grid scale) c) Basin: Rotenberger Tract (at 200 m grid scale) d) Other: as needed; designing a sub-basin scale ridge & slough-formation application (at ~50 m grid scale) • *Application*: (some may await independent peer review of model) a) CSOP b) Initial CERP Update c) CERP Decompartmentalization Project d) other CERP projects under consideration: FB&FKFS, C-111 Spreader, L-31N Pilot e) Downstream effects of STAs f) Interim operations for Rotenberger Tract g) 2003 Conceptual Plan (State Legislature mandate) h) Everglades Division research plan(s) • *Model Performance Measures (generalized)*: a) Surface water quality b) Periphyton biomass and succession c) Macrophyte biomass and succession d) Soil elevation e) Soil nutrient content • *Staffing*: a) FY03*:* 4 staff b) FY04: 7 staff	Good information.