
SOUTH FLORIDA WATER MANAGEMENT DISTRICT



Audit of the Regional Water Supply Plans

Report # 02-22

Prepared by
Office of Inspector General

Allen Vann, Inspector General
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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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August 19, 2003

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RE: Audit of the Regional
Water Supply Plans
Audit # 02-22

This audit was performed pursuant to the Inspector General's authority set forth in Chapter 20.055, F.S. The audit focused on the water supply planning process and the status of the water supply plan recommendations. Fieldwork was conducted September 2002 through May 2003. This report was prepared by Gregory Rogers.

Sincerely,

Allen Vann
Inspector General

Enclosure

c: Henry Dean
Sheryl Wood
Carol Wehle

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INTRODUCTION

This audit of the South Florida Water Management District's (the District) Regional Water Supply Plans was performed in accordance with the Office of Inspector General's approved fiscal year 2002 audit plan. This audit evaluates the planning process and status of plan recommendations.

Background

In accordance with the water supply planning provisions of Florida Statute sections 373.016 and 373.0361, the District's Planning and Development Division of the Water Supply Department is responsible for preparing Regional Water Supply Plans (the "Plans") for four basins: Kissimmee, Lower East Coast, Lower West Coast and Upper East Coast. The preparation of the plans is supported by the other three divisions of the Department including the Hydrologic Systems Modeling Division, the Technology Resources Division, and the Water Use Permitting Division.

The water supply plans provide the following required information:

- analysis of water supply sources and demand for a 20-year planning period;
- estimated water supply needs up to a 1-in-10 year drought level of certainty;
- minimum flows and levels recovery and prevention strategies for priority water bodies;
- estimated environmental restoration needs;
- recommended water resource development projects;
- descriptions of water supply development options.

The Plans have a strong interrelationship with the Comprehensive Everglades Restoration Plan (CERP). Estimated future sources and supplies of water are highly dependent upon timely completion of CERP water resource development projects.

The goal of the Plans is to ensure that sufficient water is available to avoid water shortages, to meet demands during a 1-in-10 year drought condition and provide water for the restoration of natural systems. This goal will be accomplished through using current supplies of water more efficiently, creating new water sources by capturing water currently discharged to the ocean, and by moving a portion of future water usage to alternative sources.

The Plans envision capturing existing excess water through construction of water resource development projects and water supply development projects.

- Water Resource Development Projects are primarily sponsored by the District and are major public works for water supply and flood control.
- Water Supply Development Projects include private or public facilities for water collection, treatment and delivery. They are primarily sponsored by local users.

OBJECTIVES, SCOPE AND METHODOLOGY

The objectives of the audit were to:

- 1) Evaluate the water supply planning process.
- 2) Determine the status of Water Supply Plan recommendations

The scope of the audit included the four regional water supply plans. Our audit methodology included the following procedures:

- examination of water supply plan documents,
- interviews of water supply plan managers,
- review of pertinent Florida Statute sections, water supply “white papers”, and third party analysis of water supply concepts, and
- attendance at meetings discussing the status of water resource projects.

Our audit was conducted in accordance with generally accepted government auditing standards.

FINDINGS AND RECOMMENDATIONS

Executive Summary

We evaluated the process that the Water Supply Department uses to produce regional water supply plans for the District. In our opinion the plans are produced in accordance with statutory requirements. Updates of the Plans are scheduled using less staff than the original plan production and the Department plans to draw on existing staff resources within the Department with regional planning experience to produce the reports on a timely basis.

Our review determined that the majority of water supply recommendations are on schedule. The Department tracks the status of water supply plan recommendations on a quarterly basis and management should consider adopting the CERP rating process for all of its water supply plans' recommendations.

Aquifer Storage and Recovery (ASR) is a critical technology in the plan to increase water supply. The Water Supply Department, which includes the CERP ASR program, has responded to ASR concerns through planned experiments, pilot projects and an ASR regional study. In our opinion, these planned procedures are adequate to address the ASR concerns.

Several water supply projects/initiatives have fallen behind schedule or been discontinued due to a lack of feasibility or funding. These recommendations should be reviewed during the update of the water supply plans to determine if they require repeating or deletion.

Plans should be solicited from local governments and utilities on their expected future growth and water supply needs along with their plans for implementation of water supply development projects to meet these projected needs. This process has been successful in the Lower East Coast planning region.

Finally, consistency between the water supply plans and consumptive use permitting could be improved through the establishment of performance measurements for alternative water supply, water supply development, conservation of water supplies, and restoration of water resources.

Water Supply Plans Are Produced In Accordance With Statutory Requirements

We evaluated the process that the Water Supply Department uses to produce regional water supply plans for the District. In our opinion the plans are produced in accordance with statutory requirements. The process for determining the current and future status of the District's water supply is inclusive of the best current information available and uses conservative assumptions for future estimates. The plans were developed with the benefit of public input and the status of recommendations is tracked and published in a timely manner.

The Lower East Coast Plan uses the South Florida Water Management Model as a principal tool to estimate the overall effects of water demands and supply on a regional basis. The regional model is based upon current and historical information. The other three planning regions use sub-regional groundwater models to evaluate current and future resource conditions. The Lower East Coast Plan also uses ground water models to obtain a more refined look at potential impacts in the urban areas.

Numerous water management model runs are made for different scenarios and different increments of time. The performance of a model simulation run is classified as green, yellow or red for the various components based upon the ability to protect resources and achieve hydrologic targets, water shortage frequencies, and other performance measures.

Changes are made to the model such as transferring water use to alternative sources and adding new supplies made available through time by water resource projects until model simulations are green. Based upon these model simulations, recommendations to implement needed projects are developed. Plan recommendations provide the estimated total cost of implementing the recommendations, a five-year time line of costs and staffing requirements, the potential funding source, and the implementing agencies for the recommendation.

Total costs of a recommendation are based upon planning level estimates that are useful for comparing relative cost between options.¹ We reviewed a sample of estimates and found that estimates were determined either using

¹ For CERP projects, a project implementation report (PIR) will be developed, followed by detailed designs, and then construction. Therefore, estimates of the total cost may change. The estimated cost of an option can also change due to technological advances that will enable one option to improve in comparison to another option.

conservative methodology or based upon the historical costs of similar projects. This methodology appears reasonable for planning level estimates.

The plans estimate the following staffing and funding needs for the first five years to implement the plans' recommendations:

Regional Water Supply Plan	Staff	Estimated 5 Year Cost (in \$1,000s)²
Lower East Coast ³	71	\$922,491
Lower West Coast	39	154,646
Upper East Coast	19	20,622
Kissimmee	26	7,395
Totals	155	\$1,105,154

Types of Water Supply Plan Recommendations

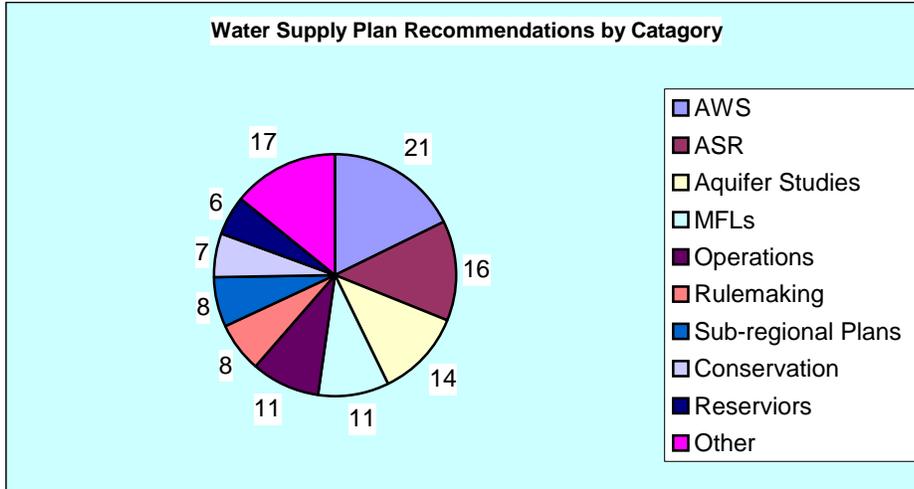
The latest dates of completion of the plans and the number of recommendations are as follows:

Regional Water Supply Plan	Completion Date	Number of Recommendations
Upper East Coast	February 1988	30
Lower West Coast	April 2000	29
Lower East Coast	May 2000	46
Kissimmee Basin	April 2000	14

The 119 recommendations contained in the Plans are concentrated toward establishing local and regional alternative water supplies (water resource development and water supply development projects), ASR (local and regional), aquifer modeling and monitoring, feasibility studies, establishing minimum flows and levels, consumptive use rulemaking and improving operations of the water control system.

² Fiscal Years are the first five following the completion date of the plan.

³ Includes \$898 million for non-Federal share for Critical Projects and CERP funding.



Water Supply Plan Updates

Regional Water Supply Plans are required to be updated every five years. The next updates of the water supply plans are due in the following years:

Regional Water Supply Plan	Required Update
Upper East Coast	2004
Lower West Coast	2005
Lower East Coast	2005
Kissimmee	2005

The available staffing for the Plan updates has decreased approximately 50% from the staff used for the production of the initial plans.⁴ These decreases could be offset by the following efficiency factors:

- second edition of the plans
- standardized format, centralized supporting documents and appendix
- expectation of fewer new initiatives contained in the plans
- contracting out technical editing
- sharing data input created for CERP

⁴ Staffing decreased from 41 individuals to 23 individuals due to restructuring of the former Planning Department and new employee assignments primarily to CERP. Time to complete the plans is limited to approximately one year for the UEC plan and two years for the other three plans.

- using the Water Resource Advisory Committee for public input

However, as the time to complete the plans has also been reduced by approximately 50%, the Department may need additional resources to complete the plans scheduled for 2005 on time. The Department anticipates that these additional resources will be drawn from existing department employees with previous regional planning experience.

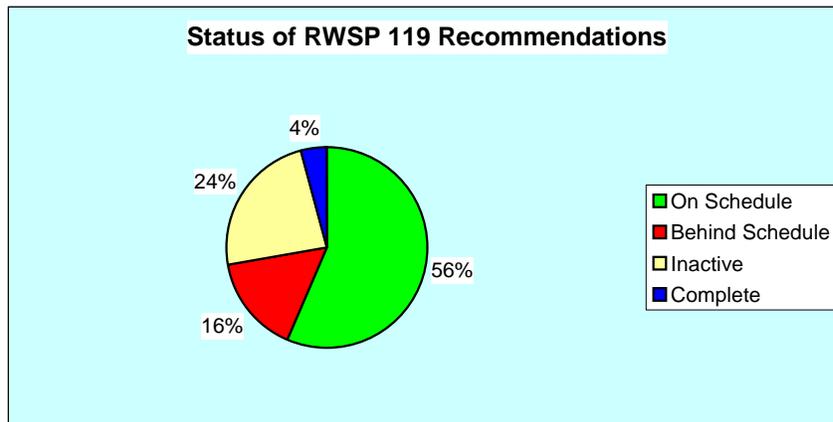
Conclusion

We determined that the Water Supply Department produces regional water supply plans for the District in accordance with State statutory requirements. The Department will be challenged to meet the deadlines for producing updates of the reports due to a reduction in available staff. However, the Department's plan to draw on existing staff resources within the department with regional planning experience to produce the reports on a timely basis appears reasonable.

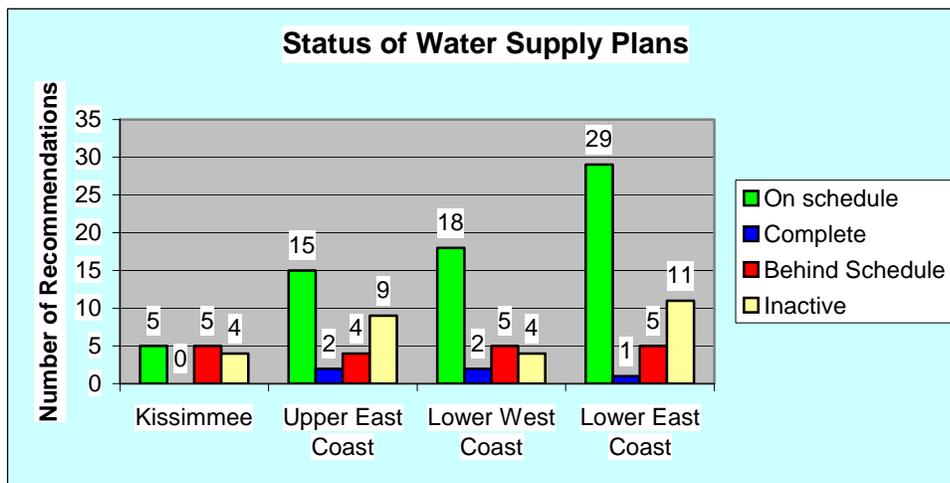
Water Supply Recommendations Are Generally On Schedule

The Department tracks the status of water supply plan recommendations on a quarterly basis. The status of CERP recommendations (48 of which are included under one recommendation in the Lower East Coast Water Supply Plan) is tracked monthly by a separate department. Different ratings are used by each tracking process; Department management should consider adopting the CERP rating process for all of its water supply plans' recommendations.

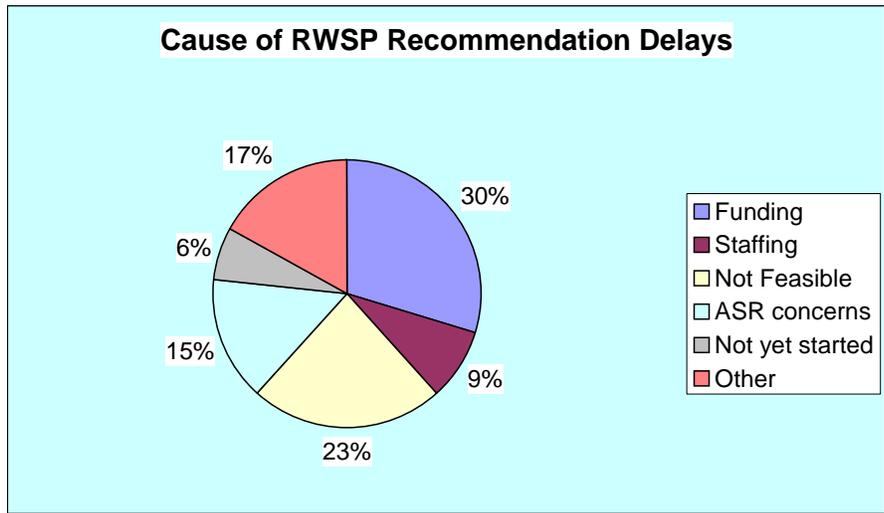
Based upon our analysis of the quarterly report dated April 2003 and discussions with Plan Managers the status of all recommendations is depicted graphically below:



The status for the four individual plans is as follows:



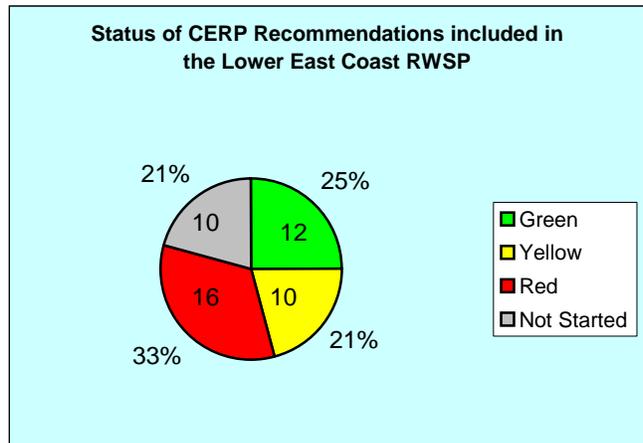
The reasons why projects were either behind schedule or inactive varied as follows:



The funding issues are addressed later in this report. The ASR concerns include water quality issues and permitting issues. These recommendations may become active depending upon the results of experiments and pilot projects. ASR concerns are addressed later in this report.

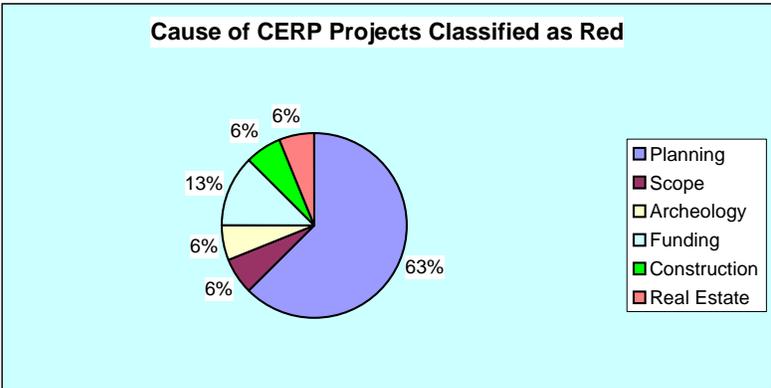
Included in the Lower East Coast Plan are 48 CERP recommendations that are tracked separately through the CERP project management process within the Northern and Southern Ecosystem Restoration Departments. As of May 15, 2003, the CERP project process classifies the status of the 48 recommendations as shown:

- **Green** - less than 5% over budget and/or less than 30 days late;
- **Yellow** - Greater than 5% over budget but less than 10% over budget, and/or greater than 30 days late but less than 60 days late;
- **Red** - Greater than 10% over budget and/or greater than 60 days late;
- **NS** - not started.



The Department's quarterly report classifies the overall CERP recommendation (included in the Lower East Coast plan) as on schedule, based upon the Northern and Southern Ecosystem Restoration Department's ranking process listing the majority of the CERP projects status as either green or yellow. This represents the current stage of the CERP project, all CERP projects have construction dates in the future and are all classified as green overall.

For the 16 CERP recommendations classified as red, the causes were as follows.⁵ The recommendations affected by planning delays were for plan specification issues, modeling, site selection, or permitting. The other delays were issues unique to that project and do not appear to indicate systematic problems.



Recommendation:

- 1. Consider adopting the CERP classification process for all water supply plan recommendations.**

Management Response: Management concurs. The CERP classification process, although simplistic, has merit for the casual reviewer to quickly determine the status of each individual project through a color classification system of red, yellow and green. The Water Supply Department will meet with CERP management to identify for the purposes of investigating the potential for some basic enhancements to the system that will offer additional information to the reviewer explaining the causal reasons behind a yellow or red score.

Responsible Department: Water Supply

Estimated Completion Date: October 1, 2003

⁵ Using the CERP project change control process, a project's schedule can be adjusted to account for timing delays and returned to a green classification.

District Is Taking Adequate Steps To Address Aquifer Storage And Recovery Concerns

Aquifer Storage and Recovery (ASR) is a critical technology in the plan to increase water supply for South Florida. The ASR program is part of the overall CERP program and will be implemented primarily by the Water Supply Department.

ASR refers to the process of storing water in the Floridan aquifer system during times when water is plentiful (wet season) and the recovery of stored water during times when it is needed (dry season). Although ASR has been used in Florida and worldwide, it has never been used on the scale anticipated by CERP and the water supply plans.⁶ The CERP includes 333 ASR wells clustered in six basins (Lake Okeechobee, Caloosahatchee River, L-8 Basin, C-51 Basin, Agriculture Reserve, and the Hillsboro basin) with a total capacity of 1.7 billion gallons of water per day at a cost of approximately \$1.6 billion.

The CERP ASR plan has undergone extensive third party review with a consensus conclusion that along with the technology's great potential there are scientific uncertainties that need to be addressed. Some of the major concerns and the District's planned response are summarized below.⁷

- treatment of water;
- capacity of the aquifer; and
- recoverability of the water;

We reviewed the adequacy of staff's planned actions for mitigating the major ASR issues. The results of our review follow.

The Federal Safe Drinking Water Act requires that any water placed into an aquifer meet drinking water quality. The Department has contracted for a study to determine whether the bacteria and other pathogens will perish prior to recovery of the water.

The composition of the Floridan Aquifer is not homogeneous and the confining layer and storage zone of the aquifer can vary in thickness. In

⁶ As of January 2002, there are at least 53 operational ASR systems in the United States with about 100 more in development or planning stages. Systems are also known to be operating in the United Kingdom, Canada, Australia, and Israel. (Pyne, 2002).

⁷ More detailed information on ASR issues is contained in reports issued by the South Florida Working Group ASR Issue Team, the Committee on the Restoration of the Greater Everglades Ecosystem (CROGEE), and the National Academy of Sciences.

response, the Department as part of CERP is planning to perform an ASR regional study to identify and address potential pressure-induced changes to the aquifer (rock fracturing) and identify engineering constraints (maximum injection pressure) using current technology and cost factors.

In addition, regional groundwater modeling of the Floridan aquifer system from Orlando to the Keys is proposed as the primary tool to estimate the final number of CERP ASR wells. The total number of wells is a critical factor in the feasibility of ASR at the scale required in CERP.

The placing of water into the Floridan aquifer and the retrieval of that water is referred to as a cycle. The amount of water recovered as compared to the amount of water placed into the aquifer is referred to as water recovery efficiency. The average recovery efficiency expected by CERP is 70%. The Department plans to assess changes in aquifer permeability that result from ASR cycle testing of the ASR wells drilled for the pilot studies. Testing after several cycles will evaluate the changing permeability of the storage zone, and its potential effect on recovery efficiency.

Finally, the District is developing a contingency plan for water storage alternatives if ASR is not feasible on the scale planned for CERP.

Conclusion:

The Water Supply Department has responded to ASR concerns through planned experiments, pilot projects and an ASR regional study. In our opinion, these planned procedures are adequate to address the ASR concerns.

Funding Issues Could Emerge For Non-CERP Water Supply Plan Projects

While CERP water supply projects are heavily supported by funding from the Federal government and the State of Florida, non-CERP water supply projects are funded primarily by District ad-valorem funding and cost sharing with local governments.

During the District's 2003 budget cycle, the Water Supply Department requested budget approval for 33 projects costing \$14.6 million for 2003 and a total cost of \$32.7 million. Only three of these projects were approved at a cost of \$5.5 million for 2003 and a total cost of \$13.6 million.

Among the projects not approved for the 2003 budget were:

- Lake Istokpoga / Indian Prairie Basin management plan
- Miami-Dade County ASR
- Florida Bay, Biscayne Bay and Lake Istokpoga minimum flows and level criteria development
- Water conservation public information and outreach.
- Reclaimed water re-use development
- Lower East Coast Floridan Aquifer System well drilling
- Lower West Coast Ground water/water quality network

The Water Supply Department estimates how resources will be allocated during implementation of the Plan recommendations through the *Proposed Five-Year Water Resource Development Work Program* document. For fiscal years 2003-2007, the District proposes to allocate the following resources towards implementing Plan recommendations:

Regional Water Supply Plan	FTE's	FY 2003-2007 (in \$1,000s)
District -wide projects	32	\$6,770
Kissimmee	33	2,005
Upper East Coast	3	762
Lower West Coast	5	4,472
Lower East Coast	107	28,465
Totals	180	\$42,474

Proposed funding for the District's responsibility for CERP and Critical Projects:

Critical Projects & CERP	FTE's	FY 2003-2007 (in \$1,000s)
Critical Projects	27	\$53,030
CERP - District Implementation	Not Stated	1,075,097
Totals	27	\$1,128,127

Although, these projects may be approved in subsequent fiscal year budgets, projects are at risk of falling behind schedule if not approved on a timely basis. The following projects/initiatives have fallen behind schedule or been discontinued because of lack of funding:

- Reclaimed water injection and drainage well treatment pilot projects for the Kissimmee Basin
- Development of Minimum Flows and Levels for the Kissimmee River, Shingle Creek and Lake Istokpoga. This is also delaying the investigation of the available water from the Kissimmee River.
- Statistical analysis of risks between water withdrawals in the Kissimmee Basin and sinkhole formation
- C-23 canal dredging – phase 4
- Floridan Aquifer well abandonment program in the Upper East Coast Lower East Coast and Lower West Coast
- Floridan aquifer data partnerships in the Lower West Coast
- Floridan aquifer system ground water model for the Lower East Coast
- Development of a Floridan Aquifer model for the Lower West Coast
- Mid – Hawthorn aquifer drilling as a part of intermediate aquifer monitoring in the Lower West Coast
- Mobile Irrigations Labs – finding stable funding for needed labs not funded by the District
- Taylor Creek High Volume Surface water ASR testing

The District's budget is a limiting factor in the statutory requirement to implement regional water supply plans. The District is actively seeking additional local sponsorship and cost sharing of water supply projects and will prioritize the projects that receive sponsorship or cost-sharing.

Several of the Water Supply Plan recommendations above require cost sharing with other local governments. These projects require the extra step of obtaining funding from the local governments in addition to the approval of District funding.

Several of the Floridan water modeling/monitoring recommendations are behind schedule. Floridan aquifer modeling is critical for a basic understanding of the aquifer hydrology necessary to understand the extent that this resource can be used. Although some of this modeling can be incorporated into the CERP ASR Regional modeling study, it must be done at a fine enough scale to be useful for the Regional Water Supply Plan updates.

Any appreciable delay in studies and modeling can affect the future timing of construction of water supply projects. These delays could have an effect on meeting the level of certainty of future water supply for South Florida and impact the regulation of water resources.

For under/unfunded recommendations that will be repeated in the updated Regional Water Supply Plans, staff will continue seeking alternative funding sources for these recommendations. These sources could include private-public partnerships or utilities. Utilities have the ability to fund long-range water supply projects through bond financing and the ability to repay the expense through billing customers for the cost of water delivery.

Recommendations:

The Department should:

- 2. Reexamine water supply plan recommendations receiving zero or minimal funding to determine if the recommendation should be repeated in or deleted from the Regional Water Supply Plans updates.**

Management Response: Management concurs. Updates to all four regional water supply plans are expected to be completed by 2005. As each plan's recommendations are formulated, specific attention will be given as to whether the recommendation was included in the first plan and whether the recommendation was not implemented. A "recommendation status section" will be included in the revised plans which documents whether this non-implementation was 1) technology based, 2) funding based, 3) permitting based, 4) not feasible or 5) not cost effective. The critical nature of the recommendation to the specific planning region in the revised plans, along with the above information,

will then aid us in determining whether the recommendation should be repeated, modified or deleted.

Responsible Department: Water Supply

Estimated Completion Date: In accordance with the Regional Water Supply Plan updates:

- **Upper East Coast** – June 2004
- **Kissimmee Basin** – April 2005
- **Lower West Coast** – October 2005
- **Lower East Coast** – December 2005

- 3. Evaluate priority of efforts supporting Floridan aquifer model development in all planning regions to ensure models can be developed at a fine enough scale to support planning and regulatory efforts.**

Management Response: Management concurs. A broad evaluation of Floridan Aquifer models and funding sources was undertaken this year as part of the FY04 budget process. A more specific evaluation identifying and potentially linking CERP needs, planning needs and consumptive use permitting needs will be undertaken in FY04. This evaluation will not only address scaling needs but also data acquisition needs necessary to populate and calibrate the models.

Responsible Department: Water Supply

Estimated Completion Date: February 15, 2004

- 4. In each planning region, plans should be solicited from local governments and utilities on their expected future growth and water supply needs along with their plans for implementation of water supply development projects to meet these projected needs as was done in the Lower East Coast plan.**

Management Response: Management concurs. Planning staff routinely coordinate with local governments and utilities in water supply planning and development processes. Steps to coordinate with these entities to update all four regional water supply plans have been initiated. The first step in this process was a mailing that involved utility service area boundaries, giving utilities a chance to comment on our data base and provide us with their boundaries, if different. This step

will be followed by providing our estimates of current and future information such as population and demand projections, size, type and location of facilities such as wellfields and treatment plants. Included in this process, utilities are requested to document their plans for development of alternative sources of water for the 20- year planning period. Internal review of the submitted data and follow- up phone calls will confirm outstanding questions and resolve discrepancy issues. Additionally, the submitted data will be reality checked through coordination with our Water Use Permitting data base and review of County Comprehensive Land Use Plans¹.

In addition to the aforementioned coordination, ten-year water supply facility workplans are now required from all local governments with a responsibility for their own water supply. The Florida statute states that these plans must consider regional water supply plans and should be completed by January 2005, or at the time of their Evaluation and Review update, whichever date occurs first. In order to complete these facility plans on time, most of the District's water suppliers will be working with our current water supply plans—not the updates. In general, the benefit of this level of recommendation for increased coordination will be fully realized in the next updates to all four regional water supply plans (Year 2009 and beyond)².

Responsible Department: Water Supply

Estimated Completion Date¹: December 2003 for activities related to updating the four regional water supply plans.

Estimated Completion Date²: January 2005, or before, depending on local governments' EAR update schedule.

Performance Measures Should Be Developed To Measure the Success of the Water Supply Planning Goal of Increasing the Use of Alternative Water Sources

In accordance with Florida Statute, the District's Regional Water Supply Plans provide a menu of water source options for transferring water use to alternative sources. These alternative water sources include:

- Floridan Aquifer System
- Reclaimed Water
- Seawater Desalination
- Aquifer Storage and Recovery

The Department uses several hydrologic performance measures and indicators to measure the effectiveness of Water Supply Plan alternatives, and to assess the performance of natural areas. These performance measures include meeting 1-in-10 year level of certainty for water supply, minimum flows and levels for priority water bodies, and restoration goals for the natural system.

Approximately 3,000 irrigation permits will renew during the next five years.⁸ Recently revised consumptive use rules will provide longer permit duration to permit holders that move a portion of water consumption to alternative sources. Utilities have shown strong interest in obtaining longer term permits which provides the Department with the opportunity to move a considerable amount of future water use to alternative sources; particularly for legal water users who are seeking an increase in their water use allocation from sources of limited water availability.

An additional benefit of transferring more water supplies to alternative sources is the potential that it could offset some of the water demand pressure if there is any appreciable delay in construction or water resource development projects, especially major storage projects in CERP.

To this end, consistency between the water supply plans and consumptive use permitting could be improved through the establishment of additional performance measurements for:

- alternative water supply,
- water supply and water resource development,

⁸ See Audit of the Water Use Permitting Program for challenges presented by the permit renewal process.

- conservation of water supplies, and
- restoration of natural resources.

The first step would be to determine the existing benchmarks for these performance measure categories. Example of such benchmarks would include the current:

- percentage of new and increased water allocation from alternative water sources
- water supply provided from water supply development and water resource development projects
- gallons per day saved from implementation of water conservation efforts
- percentage of time that minimum flows and levels are met for a priority water body

The second step would be to set goals for the desired percentage of the above categories. The third step would be to periodically calculate the overall progress towards category goals. Finally, through comparison with the goals set in step two, the Department could determine the success of moving water allocation to alternative sources, providing increased water supply through development projects, saving water through conservation efforts and meeting natural system restoration goals.

Recommendation:

5. Develop additional performance measurements for:

- **alternative water supply,**
- **water supply and water resource development,**
- **conservation of water supplies, and**
- **restoration of natural resources.**

Management Response: Management concurs. The Department currently tracks the amount of water produced as a function of our alternative water supply funding program. Additionally, the department tracks the amount of conservation realized as a result of the water use permitting program as well as the actual and potential savings from the Mobile Irrigation Lab program. Further, the water supply planning process also by statute is required to estimate the amount of water to be made available by proposed water resource development projects. A formalized yearly tracking system will be developed which reports these estimates along with a tracking system for the actual performance

of established minimum flows and levels for priority water bodies. Performance goals for alternative water supply development, water supply development and water resource development projects, water conservation and minimum flows and levels will also be established and tracked through time. To avoid duplication of ongoing work, the Department will meet with RECOVER staff to determine if additional tracking of restoration of natural resources is needed.

Responsible Department: Water Supply

Estimated Completion Date: June 1, 2004