South Florida Water Management District

Review of Water Quality Monitoring Programs

Audit # 00-03

Prepared by

Office of Inspector General

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

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April 21, 2000

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Re: Review of Water Quality Monitoring Programs – Audit #00-03

This review was performed pursuant to the Inspector General's authority set forth in Chapter 20.055, F.S. The review focused on determining whether there were opportunities to decrease the scope of monitoring on five of the District's water quality monitoring programs. Fieldwork was conducted between December 1999 and March 2000.

Sincerely,

Allen Vann
Inspector General

AV/cf
Enclosure

c: Frank Finch
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Background

The South Florida Water Management District's (the "District's") water quality monitoring program includes efforts to obtain quantitative information on the physical, chemical, and biological characteristics of various water bodies via statistical sampling. It involves taking water samples at predetermined locations and recording various physical parameters. Samples are analyzed using both internal and external lab analysis.

The District's water quality monitoring program is administered by the Environmental Assessment and Monitoring Department and includes 59 distinct programs consisting of 2,152 sites for surface waters within its boundaries. Water quality monitoring programs are classified, by the District, as belonging to one of the following three categories:

Type I – Programs where a legal mandate dictates all details of the sampling program including locations, parameters, frequency, analytical methods, and data reporting. There are a total of 873 sites (41% of total) representing 21 different monitoring programs.

Type II – Programs where legal mandate dictates the need to monitor but does not specify how, when, or what to monitor. The District must determine what level of effort is needed to meet the goals and objectives of the mandate. There are a total of 438 sites (20% of total) representing 20 different monitoring programs.

Type III – Programs where there are no legal mandates but the information obtained from these programs are considered to be critical to the overall mission of the District. There are a total of 841 sites (39% of total) representing 18 different monitoring programs.

The monitoring program encompasses a wide variety of South Florida's ecosystems, urban, and agricultural uses encompassing lakes, rivers, estuaries, canals, wetlands, dairies, and cattle ranches. Data collected from routine monitoring programs are often used to supplement more specific water quality studies. Monitoring programs have been designed to directly support the following legislative acts, permits, agreements, and technical advisory committee recommendations:

- Surface Water Improvement and Management (SWIM) Act
- Lake Okeechobee Operation Permit
- The "Three Party Agreement"
- Miccosukee Tribe Memorandum of Agreement
- Holey Land Operating Permit
- Everglade's Forever Act
- Everglade's Settlement Agreement of 1991
- ENR Operating Permit

The FY 2000 adopted budget for all District water quality monitoring activities is as follows:

Activity	FTE's	Total FY2000 Budget
Data Collection	47.45	$ 3,183,468
Lab Analysis	20.55	3,762,075
Support	5.00	484,196
QA/QC	10.00	610,404
Water Quality Reporting	11.50	719,660
Totals	**94.50**	**$ 8,759,803**

Source: Environmental Assessment & Monitoring Department. Amounts include leased workers.

Objectives, Scope, and Methodology

The objective of our audit was to review various selected water quality monitoring programs to determine if there exist any opportunities to decrease the extent of monitoring performed.

We sought to achieve our objective by determining if the data from the selected water quality monitoring programs were being used, meaning routinely reviewed and analyzed. If so, we would conclude that the monitoring was justified. If, on the other hand, the data were not being used, we questioned the justification for continued collection of the data.

Management of the Environmental Monitoring and Assessment Department helped identify the following five water quality monitoring programs for review:

- Manatee Bay/Long Sound (Type I)
- Biscayne Bay Water Quality Monitoring Program (Type II)
- Indian River Lagoon (Type II)
- Upper and Lower East Coast (Type III)
- Lake Istokpoga Water Quality Monitoring Program (Type III)

See the appendix for additional information regarding these programs.

Our examination of these programs was limited because of the lack of a management information system that adequately captures water quality monitoring activities. Because of this and the complex technical nature of this program, we relied heavily on representations made by management in formulating our conclusions and recommendations. While much of this testamentary evidence was corroborated, it still lacks the sufficiency that other forms of documentary evidence would have provided. As a result of the aforementioned limitations, we do not represent that this review constitutes an audit in accordance with generally accepted government auditing principles.

Findings

Summary

We were unable to find a customer, a sponsor, or anyone who has used the water quality monitoring data collected for the Lake Istokpoga program. While there is some evidence to suggest that the data might now prove useful, we are not certain why this condition (no data users) occurred. We identified several possible reasons: there is no mandate for the program, it was never documented "why" monitoring should be performed or who requested it and who authorized it. There is a lack of formal communication between the data providers and data customers. We recommend that periodic customer surveys be performed and that the cost of monitoring be captured. Further, we recommend that in the future, new monitoring programs be initiated only after written justification is reviewed and approved. This written justification should also establish accountability for the data. This is important because the level of monitoring will be increasing significantly as new programs come on line.

We also found that there is no mechanism in place to track the costs of monitoring. Management estimates that the data collection effort resulted in the District expending approximately $352,000 since the Lake Istokpoga program's inception, 12 years ago.

For the other four programs, we noted differences in the current level of interest in the data. Some data were currently being reviewed while other data hadn't been reviewed for several years. This appears to be due to changing District priorities. The value of the data is not in its accumulation but its analysis and use in decision making. Required periodic reporting of water quality monitoring data would prevent data from accumulating for years without being analyzed.

Finally, the Environmental Monitoring and Assessment Department is in the process of conducting reviews of the District's routine monitoring programs that are not specifically tied to a mandate. These reviews should compare monitoring activities with the objectives of the programs that they support to ensure that the monitoring meets the needs of the customers.

Project Justification and Project Management System Needed

We were unable to identify a sponsor, or any customer, of the data collected on Lake Istokpoga (ISTO). Further, we could not locate any documentation that explains why monitoring activities on Lake Istokpoga were initiated. The data collected does not support any major District initiatives or programs and as a result, there has never been any demand for the data. While we are not sure of the reason for this condition, we have identified several possible contributing factors such as: the lack of a mandate, not documenting why monitoring was initiated, or who authorized it, and the lack of a formal channel of communications between data providers and data customers. Furthermore, there is no process to track data collection costs. Management estimates that the data collection effort resulted in the District expending approximately $352,000 since the program's inception in 1988.

The ISTO monitoring program is not required by any law, regulation, permit, memorandum of agreement, or other mandate. A mandate quite often includes a provision requiring that the data be periodically analyzed and reported on. Without a mandate, there is no reason to review the data, unless some other circumstance arises that would create a need for the data. Such a circumstance appears to have recently arisen as we were told that the data might now be useful in determining phosphorus loading impacts that could occur in the upcoming Lake Istokpoga drawn-down project.

"Why do we want to monitor?" is a question that experts in the field of water quality monitoring recommend asking before initiating a water quality monitoring program. The answer to this question should result in the development of clearly defined goals and objectives for the program. It is further suggested that an overall systems approach be applied to water quality monitoring programs that considers two major aspects: (1) monitoring purpose (answers the "Why" question) and (2) monitoring activities (answers the "How" question). Carefully defining and documenting the goals and objectives helps to clearly define the purpose of water quality monitoring, which can then be translated into specific monitoring activities.

Another reason that the program might have continued despite the lack of interest in the data could be that costs associated with water quality monitoring programs are not systematically tracked and reported. Water Resource Operations currently tracks the cost of operations and maintenance activities in the Computerized Maintenance Management System, however, no such system is being used to track the costs of water quality monitoring programs. This is not

to say that program managers were not sensitive to the cost of this program. In September 1997, they sought to have the ISTO program terminated so as to free up ¼ man-year and eliminate laboratory analyses. They were unsuccessful in their attempt to end the program; however, they convinced executive management to reduce the sampling frequency from bimonthly to quarterly, thus, saving 1/10 of a man-year annually. Accumulating and reporting on actual costs associated with water quality monitoring programs would allow management to state program costs in terms of dollars instead of FTE's (full time equivalents) and numbers of analyses. Also, knowing the cost of a program will allow program managers to make better informed decisions about their monitoring activities.

A channel of formal communication has not been established between the data providers and their customers. The communication could take the form of a customer service survey whereby the customer is asked to provide input as to whether the support function is adequately meeting their needs. This would promote regular communications between data providers and customers.

It should be noted that steps are now being taken to correct some of these shortcomings. The Environmental Monitoring and Assessment Department is in the process of conducting reviews of the District's routine monitoring programs that are not specifically tied to a mandate. The reviews will be conducted internally by interdepartmental teams.

The reviews will assess the monitoring programs for their ability to meet the designed goals and objectives of the programs that they support. This will aid in identifying any other water quality monitoring activities that do not support District programs. This will also help determine if the frequency, locations, or parameters in each program are reasonable and not excessive. This assessment should put program managers in a better position to assess their data needs and make determinations about the extent of monitoring that is required to be performed. In addition, potential areas for optimization will be identified. A review of the Upper Chain of Lakes monitoring programs is currently underway and is being accomplished through an interdepartmental effort between the Environmental Monitoring and Assessment Department and Watershed Research and Planning. It is anticipated that each Type III program will be evaluated in a similar manner. This effort could not have been more timely because District demands for water quality monitoring data are going to increase significantly in the future.

In addition to program reviews, the District is currently undertaking a MIS Implementation Project in order to select and implement new computer hardware and software for all financial and human resource applications. The goals of this new system will be to support efficient business processes that meet the

organization's objectives and to provide meaningful information about District operations needed to support effective management of District resources. The tracking of water quality monitoring program costs should be considered for inclusion in this effort.

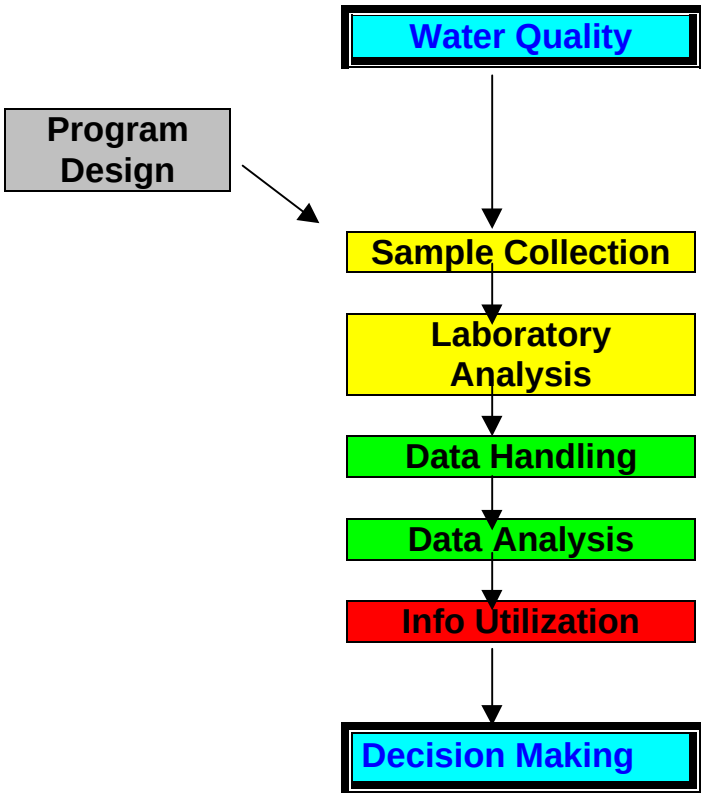
Water Quality Monitoring Data Not Analyzed Regularly

We were able to identify customers for the four remaining programs; however, water quality monitoring data for these programs were not analyzed regularly. Shifting District priorities resulted in some data not being reviewed and analyzed for years. The ultimate goal of water quality monitoring is to provide information for use in decision making. When data is collected but not analyzed it can't be used, or may not be needed immediately, for decision making. As a result, the District may not have a current and complete picture of the status of the water body.

Locating customers of the water quality monitoring data was, for the most part, relatively easy. However, finding a customer of the Manatee Bay/Long Sound program data took some additional inquiry. This occurred because the permit that mandated this monitoring effort expired in 1994 and it was unclear as to who was now using the data. Additionally, we found considerable disparity in the level of attention given to the data. For example, we found that data collected in the Indian River Lagoon was currently being highly scrutinized while the data collected for the Manatee Bay/Long Sound program hadn't been reviewed in several years.

Until data are analyzed it is not useful. The reason that water quality monitoring data is collected is to provide information that can be used in the decision making process. Following is a diagram of the flow of information through a monitoring system:

Monitoring Activities



As can be seem from the diagram, sample collection and laboratory analyses occur relatively early in the process. The data that is collected does not become useful until it is analyzed and the information is used for decision making.

The reason for the disparity in the level of attention given to water quality monitoring data appears to be due to shifting District priorities. The much publicized water quality issues surrounding the Indian River Lagoon now makes that monitoring program a high priority; however, this has not always been the case. We were informed that a period of approximately eight years elapsed when the data were, at best, only superficially reviewed. Conversely, Manatee Bay/Long Sound program data has not been analyzed in several years. However, it was scrutinized closely in 1995 when the C-111 Interim Construction Project permit required that the data be analyzed and a report be prepared on the impact of various changes to the South Dade Conveyance System. Since that time the permit has expired and there is no longer any requirement to review and report on the data. While the data is still important, allowing its accumulation results in program managers having to sift through large volumes of data, perhaps performing additional quality assurance procedures, before any analysis can be performed. For example, the Indian River Lagoon program managers are

currently sifting through eight years of data. Finally, and most importantly, periodic review of the data will allow program managers to convert the data to information useful for decision making.

Based on the impact of changing District priorities on data usage, and the potential value of data in the future, we do not recommend curtailing or eliminating monitoring projects based solely on the current interest in or use of the data. Instead, we would recommend that the District require that all data collection efforts be reviewed, analyzed, and reported on at regular intervals such as every two or three years. This will ensure that the data have been properly quality assured and will prevent program managers from having to play "catch-up" for many years of accumulated data. Finally, it will give program managers a current picture of the state of the water body.

Recommendations

1. **Water quality monitoring programs should not be instituted without first documenting why the program is needed with appropriate approvals.**

   Management Response: Management concurs with the recommendation. There are currently two mechanisms in place for review and approval of new monitoring programs. One is through the annual budget process where final approval of monitoring programs is done at budget adoption. The other mechanism is the Environmental Monitoring and Assessment (EMA) Department's Unbudgeted Request process. Unbudgeted requests for additional monitoring programs are generated in mid-fiscal year, and require approval by the requesting Department as well as EMA. To date, neither of these two mechanisms has required a written detailed scope of work that documents the need for the monitoring work to be done. EMA will require all requesting departments to develop a one page scope of work for budget year proposed monitoring as well as mid-year unbudgeted requests. Prior to initiation of the monitoring programs, both EMA and the requesting department will have to approve the one-pagers.

   Responsible Dept.: Corporate Resources/Environmental Monitoring and Assessment Department

   Estimated Completion Date: May 1, 2000

2. **Executive Management at the District should require that data customer departments perform periodic analysis and reporting of water quality monitoring data.**

   Management Response: Management agrees with the need for periodic assessments of the data by customer departments. To the maximum extent possible, EMA will encourage customer departments to analyze and report on their data, and if necessary will provide skilled analysts through the Expert Assistance Program to help customer departments. EMA will also enhance data and report access through development of improved web sites.

   Responsible Dept.: Executive Office/Water Resources Management/Corporate Resources/ Environmental Monitoring and Assessment Department

   Estimated Completion Date: Ongoing

3. **The Environmental Monitoring and Assessment Department should survey customers of water quality monitoring data annually to verify that data is necessary and is being used.**

   Management Response: Management concurs. This is already on going. EMA has conducted annual customer surveys in the last two years. In addition, Water Quality division staff meets with monitoring program project managers on a monthly basis to review status of the programs.

   Responsible Dept.: Corporate Resources / Environmental Monitoring and Assessment Department

   Estimated Completion Date: Implemented

4. **A management information system that tracks inputs and provides meaningful outputs should be established for water quality monitoring activities.**

   Management Response: Management concurs. The Water Quality Division can currently track the lab costs for each monitoring program via the new Laboratory Information Management System (LIMS). However, the costs for sample collection are not easily captured. EMA will request that provisions be made to capture these costs in the development of the new Management Information System.

   Responsible Dept.: Corporate Resources / Environmental Monitoring and Assessment Department/ Information Technology Department

   Estimated Completion Date: July 2001

Appendix

Note: The following program descriptions were excerpt from Technical Memorandum #356, Surface Water Quality Monitoring Network, South Florida Water Management District, January 1998.

Biscayne Bay Water Quality Monitoring Program (BISC)

This is a cooperative program with Miami-Dade County Department of Environmental Resources Management (DERM) which consists of monthly surface water quality monitoring in Biscayne Bay and its major tributaries.

DERM began routine monitoring of 48 fixed stations in Biscayne Bay and its major tributaries in March 1979. Over the years, sampling stations were added and the parameter matrix was modified. The most significant changes came when the District began funding the Program in 1988 as part of the Biscayne Bay Surface Water Management and Implementation (SWIM) Plan. Stations were added primarily in the tributaries and the parameter mix was expanded in an effort to 1) detect spatial, seasonal, and inter-annual trends and possible impacts on the health of the bay ecosystem; and 2) identify areas of potential degradation. The data have been instrumental in documenting a variety of impacts to surface water quality in Biscayne Bay and continue to give direction for investigations and remedial actions.

The routine water quality monitoring program consists of 90 stations at which monthly samples are collected and analyzed for a variety of physical, chemical and biological parameters to characterize the water quality. The current contract with Miami-Dade DERM is for $200,000 a year.

Indian River Lagoon (IRL)

This is a lagoon wide monitoring program that involves four other agencies, the St. Johns River Water Management District, Volusia County, Brevard County, and Indian River County. The District's jurisdiction encompasses a 40 mile stretch of the lagoon from Jupiter Inlet to the northern boundary of St. Lucie County. The water quality monitoring program was established to provide a water quality data base for:

- documenting known problem areas within the lagoon system, especially those that are located near urban areas and point source discharges;
- locating and reviewing existing stations monitored by state, regional and local environmental groups;

- locating and establishing monitoring stations in the lagoon and it's tributaries not currently being monitored;
- determining parameters that will best evaluate the water quality of the lagoon;
- establishing water quality assurance requirements for the field and laboratory; and
- documenting long term trends within the lagoon, especially in areas where good biological or water quality conditions currently exist.

This is a SWIM program that began in October 1988. The SWIM Act requires that both the St. Johns River Water Management District and the South Florida Water Management District develop SWIM Plans for the Indian River Lagoon. The collection and analysis of the samples were contracted out during the first two years of the study. In October 1990, the collection and analysis of the samples within the SFWMD boundaries were taken over by the SFWMD.

The data collected at the 40 sites monitored by the District can indicate any changes in water quality, and allow for better management of the Indian River Lagoon for environmental enhancement, and prevention of any further degradation.

We were unable to get cost information for this program; however, it is estimated that it requires 2.069 FTE's per year.

Upper and Lower East Coast (WQM)

This program was initiated in 1979 and includes coastal portions of St. Lucie, Martin, and Palm Beach Counties. Nine sites are monitored under this program for various parameter groups. This monitoring program provides a water quality and nutrient loading database for:

- determining loading to the Indian River Lagoon, St. Lucie Estuary, Loxahatchee River, and Lake Worth Lagoon;
- determining long and short term trends;
- identifying seasonal and discharge related water quality trends, calculating material loads, basin-wide area; export rates and flow-weighted concentrations; and
- implementing a comprehensive monitoring and research plan as described in the "Lake Okeechobee Monitoring and Research Plan."

The estimated FTE's required to perform monitoring is .294 annually at a cost of $55,000.

Manatee Bay/Long Sound (MBLS)

This program is conducted in the C-111 canal, Manatee Bay, Barnes Sound and Long Sound areas and is performed in conjunction with the C-111 monitoring and operation permit, since expired. Water quality monitoring is performed when at least 3 of the 13 culverts are opened at structure S-197. Various biological and hydrological monitoring occur at the same time. Miami-Dade County DERM has taken over the monitoring under contract with the District. The MBLS water quality monitoring program provides a data base for:

- determining Manatee Bay/Barnes Sound salinity responses to storm related discharges at S-197;
- establishing salinity gradients in Northeast Florida Bay associated with normal flow diversions through the C-111 gaps;
- monitoring any additional influx of nutrients in the Everglades National Park eastern panhandle resulting from the gaps;
- monitoring salinity and water quality impacts downstream of S-21; and
- establishing spatial impacts on salinity gradients, and how quickly they are re-established following a discharge event.

Under this program 22 sites are monitored; nutrients and physical parameters are sampled for 8 sites while only physical parameters are monitored for the remaining 14 sites. This sampling program has been contracted out to Miami-Dade County at a cost of approximately $12,000 annually. The District still performs the required laboratory analysis.

Lake Istokpoga (ISTO)

The Lake Istokpoga water quality monitoring program encompasses the major inflow and outflow points to the lake as well as in-lake monitoring. The water quality monitoring program provides a water quality and nutrient loading data base for:

- consolidating information from all previous publications to establish historical trends;
- determining long and short term trends to identity potential problem areas of water quality degradation and nutrient loading;
- producing a nutrient budget for the lake;
- noting changes in water quality after herbicide treatments to the lake; and
- establishing acceptable nutrient loading limits using eutrophication models.

Water quality monitoring began in February 1988. Nutrient loading is calculated by combining nutrient concentrations with flow data obtained at the major inflow and outflow points to the lake. These data can indicate trends in water quality and allow for better management of the system to monitor for environmental enhancement or degradation. Values that deviate significantly from established criteria may signal a concern requiring immediate attention. Twelve sites are monitored under this program for various parameters. Lake Istokpoga is a low SWIM Plan priority and the frequency of monitoring has been reduced from bimonthly to quarterly. It is estimated that the monitoring program requires .15 FTE's at a cost of approximately $12,000 annually.