# TECHNICAL PEER REVIEW OF MINIMUM RECOMMENDED LEVELS: LAKE BUTLER, FLORIDA

**PREPARED FOR**

## Suwanee River Water Management District

**PREPARED BY**

DSV
DUNN, SALSANO & VERGARA CONSULTING, LLC
HELPING CLIENTS MEET THEIR WATER RESOURCE NEEDS

BFA Environmental Consultants
Barnes, Ferland and Associates, Inc.

**JANUARY 23, 2017**

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# EXECUTIVE SUMMARY

The Suwannee River Water Management District (District) has included Lake Butler, located in Union County, Florida, on its current priority list and schedule for the establishment of minimum flows and levels (MFLs). based on the provisions of Subsection 373.802, Florida Statutes (F.S.). Also, based on the provisions of this Subsection, SRWMD has identified Lake Butler as a water body for which the District will undertake independent scientific peer review.

The District staff has developed recommended MFLs for Lake Butler. These recommended MFLs are described in a document titled *Minimum Recommended Lake Levels: Lake Butler, Florida. Draft Report October* 2016. In support of development of these recommended MFLs, the District contracted with the consulting firm of Environmental Consulting &Technology, Inc. (ECT) for performance of water budget modeling. The work performed by ECT is described in a document titled *Lake Butler Water Budget Modeling-Phase B Technical Report-Final*, dated August 2016.

The District has engaged the services of two experts with collective expertise in the fields of hydrology, limnology, and biology to serve as a peer review panel (panel) to review and evaluate information used for development of recommended MFLs for Lake Butler. These panel members are from the water resources consulting firm of Dunn, Salsano & Vergara Consulting, LLC (DSV), which is acting as a sub consultant to the environmental consulting firm of Barnes, Ferland and Associates, Inc. These panel members include

- Donthamsetti Rao, Ph.D., P.E.,
- Bill Dunn, Ph.D.

These two panel members have worked extensively together in matters concerning the development, peer review, and implementation of MFLs in Florida for more than 25 years and have collective professional experience that exceeds 75 years in Florida

This report utilizes a tabular template for each of the peer reviewers to address the District's peer review requirements. Included as appendices are two sets of summary tables to capture the key elements of each technical review. The first set of tables, the review comments tables, summarizes each panel member's individual general and specific review comments along with any recommended actions (Appendix Tables 1-1 and 1-2). Each comment is treated as a separate row in these tables. The second set of tables, (the peer review assessment criteria tables) includes each panel member's comments concerning the District's peer review assessment criteria, (Appendix Tables 2-1 and 2-2).

Dr. Dunn's review indicates that the District has done a commendable job in developing the proposed minimum levels. He agrees with basic assumptions, methods of data collection, much of the data analysis and presentation, and the development and selection of two minimum levels.

However, managing uncertainty, which should be part of every MFLs setting process, is not addressed in an explicit and integrated approach in the District's report. Dr. Dunn believes the management of uncertainty is best accomplished as an adaptive management (AM) process and suggests that a comprehensive assessment of major sources of uncertainty and the magnitude of each source should be addressed in an explicit plan to manage the effects of uncertainty and reduce its impacts in the future using an AM approach.

Dr. Dunn also comments that a specific source of uncertainty in reviewing the recommended minimum levels for Lake Butler is the inability to check and validate most of the statistical analyses relied upon for summary and/or analysis of field data collected for ground elevation,

vegetative communities, and soils. The lack of validation leaves the results presented open to question, and thus is a significant source of uncertainty. This omission should be corrected.

Dr. Dunn also points out that by their very nature MFLs are adaptive strategies for management of the District's critically important water bodies. Each adopted MFL, as well as the District's entire MFLs program define an adaptive, learn as you go, management strategy. Dr. Dunn has concluded that the District would benefit from an explicit adaptive management approach that is based on identifying and addressing elements of uncertainty.

A very important and significant conclusion from Dr. Rao's analysis is that the analysis utilized to assess compliance with recommended MFLs is flawed such that the finding that both minimum levels were being met in the baseline year of 2006 is incorrect and compliance with the recommended frequent low level (FL) under current conditions is misinterpreted. More specifically, he concludes that the recommended FL is not being met under current conditions. This conclusion has a cascading effect on the District's estimate of available water for development. He supports his conclusion with his own analysis, which is included in the main body of this document.

If, as Dr. Rao concludes, the recommended FL is not being met under current conditions, then there is no more freeboard available locally in the Upper Floridan aquifer, and it may be that the water use is currently over-allocated. If upon review of this conclusion by the District, this proves to be the case, then a prevention and/or recovery strategy may be required.

Overall the peer reviewers find that most, but not all, of the conclusions in the two MFL reports are supported by the analyses presented. The reviewers generally concur with data and information collected, the data collection methods, the methods used for analysis and interpretation, and the two minimum levels recommended. We do however, disagree with the compliance assessment for the FL. We also suggest that additional work be done to address two important issues: 1) quality assurance, and 2) the management of uncertainty.

Regarding the compliance assessment for the FL, Dr. Rao recommends a preferred approach for fitting a line to the data in the Weibull probability plots. In doing this himself Dr. Rao concluded that the FL is not being met under year 2006 conditions. Dr. Rao gives specific instructions for reanalyzing the FL, and he has provided his own analysis in a Figure 1 of this document. If, as Dr. Rao concludes, the FL is not being met under current conditions, then there is no more freeboard available in the upper Floridan aquifer, and it may be that the water use is currently over-allocated. If upon review of this conclusion by the District, this proves to be the case, then a prevention and/or recovery plan may be required.

In light of Dr. Rao's finding that the FL is not met under current, or future conditions the reviewers ask what hydrologic factors cause or contribute to this potential violation of the FL. If Dr. Rao's finding that the FL is not being met under current conditions is confirmed, then the District should next investigate the causal factors. The District's report suggests that current and historic hydrologic conditions controlling the lake basin's water budget do not indicate significant changes in the land use, runoff characteristics, basin alterations, surface water withdrawal, or regional groundwater use. The reviewers note that if Dr. Rao's finding is confirmed, then the District will be required by rule to develop a recovery and/or prevention plan to address causal factors, and develop specific strategies to reduce the source(s) of hydrologic stress on the Lake Butler ecosystem.

The reviewers recommend discussion of two additional issues in the document. The two issues are intimately linked; they are the management of uncertainty and the adoption of an explicit adaptive management approach to using the minimum levels to manage the health of the Lake Butler ecosystem. However, managing uncertainty, which should be part of every MFLs setting

process, is not addressed in an explicit and integrated approach in the District's report. Dr. Dunn believes the management of uncertainty is best accomplished as an adaptive management (AM) process and suggests that a comprehensive assessment of major sources of uncertainty and the magnitude of each source should be addressed in an explicit plan to manage the effects of uncertainty and reduce its impacts in the future using an AM approach.

On the topic of AM, Dr. Dunn points out that by their very nature MFLs are adaptive strategies for management of the District's critically important water bodies. Each adopted MFL, as well as the District's entire MFLs program define an adaptive, learn as you go, management strategy. The District would benefit from an explicit adaptive management approach that is based on identifying and addressing elements of uncertainty.

# INTRODUCTION

The Suwannee River Water Management District (District) has contracted with a panel of two experts to provide a technical peer review of its proposed minimum flows and levels (MFLs) for Lake Butler in Union County, Florida.

These proposed MFLs for Lake Butler are described by the District in a document titled *Minimum Recommended Lake Levels: Lake Butler, Florida. Draft Report October* 2016. The documentation also included a separate volume titled *Lake Butler Water Budget Modeling-Phase B Technical Report-Final*, dated August 2016. The latter document was authored by Environmental Consulting &Technology, Inc. (ECT).

District staff developed multiple recommended minimum levels for Lake Butler using methods developed and refined by the St. Johns River Water Management District (SJRWMD). These methods were supported by methods developed by the Southwest Florida Water Management District (SWFWMD). The District proposes two minimum levels for Lake Butler

District staff developed multiple levels to protect critical water resources over the full, dynamic range of the lake's hydrologic regime. Data collection covered a time series of water levels, vegetation, soils, topography, and delineation of wetland to upland break. A baseline lake level record was developed for Lake Butler. Critical resources identified for protection included floodplain inundation, habitats for fish and invertebrates, and maintenance of hydric soils.

SJRWMD methods define MFLs as hydrologic events defined by three components: a magnitude (in this case water depth), a continuous duration (days), and an annual return interval. For Lake Butler staff proposed two minimum levels a minimum frequent high (FH) and minimum frequent low (FL) as follows:

- The recommended FH is a stage elevation of 129.55 feet (ft) NAVD88, a duration of 30 days, and return interval of 2 years.
- The recommended FL is a stage elevation of 127.30 ft NAVD88, a duration of 120 days and a return interval of 5 years.

In support of MFLs development the District contracted with ECT to develop a water budget model for Lake Butler. ECT utilized the Storm Water Management Model (SWMM) Version 5.1 to develop the water budget model for Lake Butler. Model development, calibration, and use of the model for long term simulation are described in ECT's report.

The District is committed to the independent scientific peer review of all data, methodologies, and models used in the establishment of MFLs. Accordingly, the District voluntarily engaged the services of two independent experts with collective expertise in the fields of hydrology, limnology, and biology. These experts served as a peer review panel to evaluate and review information used for development of recommended MFLs for Lake Butler.

These expert reviewers are from the water resources consulting firm of Dunn, Salsano & Vergara Consulting, LLC (DSV), which is acting as a sub consultant to the environmental consulting firm of Barnes, Ferland and Associates, Inc., and include:

- Donthamsetti Rao, Ph.D., P.E.,
- Bill Dunn, Ph.D.

## PEER REVIEW PANEL'S SCOPE OF WORK

This document provides a summary of the panel's completion of its contracted scope of work, covering the following three major tasks.

> Task 1—Participate in project kick-off meeting, and attend a field inspection trip of data collection sites on and adjacent to Lake Butler.
>
> Task 2—Perform review of relevant documents and publications.
>
> Task 3--Develop a single final peer review panel report for submission to the District.

With the submittal of this document, the panel's final report, Tasks 1 through 3 of the panel's work effort is complete. Task 1's kickoff was completed on November 15, 2016, as a net-meeting hosted by District staff. The net-meeting provided the reviewers with an overview of the District's approach to setting MFLs, data collection and data analysis methods, results, and recommended minimum levels. Task 1's field inspection took place on November 20, 2016. The field inspection included an extensive tour of the lake by boat conducted by District staff involved in development of the recommended minimum levels and authoring the draft report. The field inspection allowed reviewers direct observation of aquatic, wetland, and upland communities; vegetation and soil sampling transects; and other monitoring locations. The inspection trip also allowed reviewers an opportunity to ask questions of staff regarding: methods of data collection and analysis, rationale for selection of sampling locations, types and nature of uncertainty, and any needs for additional data collection that could be useful for implementing the minimum levels and assessing compliance in future.

## PEER REVIEW APPROACH

Section 373.042, F.S., provides that MFLs shall be calculated using the best information available, that the Governing Board shall consider and may provide for non-consumptive uses in the establishment of MFLs, and when appropriate, MFLs may be calculated to reflect seasonal variation. The law also requires that when establishing MFLs, changes and structural alterations to watersheds, surface waters, and aquifers shall also be considered (Section 373.0421, F.S.). The State Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code) includes additional guidance for the establishment of MFLs, providing that:

> *…consideration shall be given to the protection of water resources, natural seasonal fluctuations in water flows or levels, and environmental values associated with coastal, estuarine, aquatic, and wetlands ecology, including:*
>
> *a. Recreation, in and on the water;*
> *b. Fish and wildlife habitats and the passage of fish;*
> *c. Estuarine resources;*
> *d. Transfer of detrital material;*
> *e. Maintenance of freshwater storage and supply;*
> *f. Aesthetic and scenic attributes;*
> *g. Filtration and absorption of nutrients and other pollutants;*
> *h. Sediment loads;*
> *i. Water quality; and*
> *j. Navigation.*

Section 373.042, F.S., also addresses independent scientific peer review of MFLs, specifying the review of all scientific or technical data, methodologies, and models including all scientific and technical assumptions employed in each model, used to establish a minimum flow or

minimum water level. In addition, the law requires that the Florida Department of Environmental Protection (FDEP) or the Governing Board shall give significant weight to the final peer review panel report when establishing the minimum flow or minimum water level.

This report utilizes a tabular template for each of the peer reviewers to meet the District's peer review requirements. Included as appendices are two sets of summary tables to capture the key elements of each technical review. The first set of tables, the review comments tables, summarizes each panel member's individual general and specific review comments along with any recommended actions (Appendix Tables 1-1 and 1-2). Each comment is treated as a separate row in these tables. The second set of tables, the peer review assessment criteria tables, include each panel member's comments concerning the District's peer review assessment criteria (Appendix Tables 2-1 and 2-2).

The District's peer review assessment criteria, addressed by each panel member in the second set of appended tables are as follows:

(A) Determine whether the conclusions in the report titled *Minimum Recommended Lake Levels: Lake Butler, Florida. Draft Report October* 2016 (subject report) are supported by the analyses presented.

1. Supporting Data and Information: Review the relevant data and information that support the conclusions presented in the report to determine whether:
    (a) the data and information used were properly collected;
    (b) reasonable quality assurance assessments were performed on the data and information;
    (c) exclusion of available data from analyses was justified; and
    (d) the data used was the best information available.

    **Note:** The peer review panelists were not expected to provide independent review of standard procedures used as part of institutional programs that have been established for collecting data, such as the USGS and District hydrologic monitoring networks.
2. Technical Assumptions: Review the technical assumptions inherent to the analysis used in the subject report to determine whether:
    (a) The assumptions are clearly stated, reasonable, and consistent with the best information available.
    (b) The assumptions were eliminated to the extent possible, based on available information.
    (c) Other analyses that would require fewer assumptions but provide comparable or better results are available.
3. Procedures and Analyses: Review the procedures and analyses used in the subject report to determine whether:
    (a) The procedures and analyses were appropriate and reasonable, based on the best information available.
    (b) The procedures and analyses incorporate all necessary factors.
    (c) The procedures and analyses were correctly applied.
    (d) Limitations and imprecisions in the information were reasonably handled.

(e) The procedures and analyses are repeatable.

(f) Conclusions based on the procedures and analyses are supported by the data.

(B) If a proposed method used in the subject report is not scientifically reasonable, the Peer Reviewers shall:

1. List and describe scientific deficiencies and, if possible, evaluate the error associated with the deficiencies;
2. Determine if the identified deficiencies can be remedied.
3. If the identified deficiencies can be remedied, then describe the necessary remedies and an estimate of time and effort required to develop and implement each remedy.
4. If the identified deficiencies cannot be remedied, then, if possible, identify one or more alternative method that are scientifically reasonable. If an alternative method is identified, provide a qualitative assessment of the relative strengths and weaknesses of the alternative method(s) and the effort required to collect data necessary for implementation of the alternative method(s).

(C) If a given method or analyses used in the subject report is scientifically reasonable, but an alternative method is preferable, the Peer Reviewers shall:

1. List and describe the alternative, scientifically reasonable method(s) and include a qualitative assessment of the effort required to collect data necessary for implementation of the alternative method(s).

# SUMMARY OF REVIEW PANEL COMMENTS/ QUESTIONS

As described, each reviewer's detailed comments are Included in appendices as a set of two summary tables that capture the two key elements of each technical review. The first set of tables, the review comments tables, summarize each reviewer's individual general and specific review comments on the subject document along with any recommended actions (Appendix Tables 1-1 and 1-2). Each comment is treated as a separate row in these tables. The second set of tables provides each panel member's conclusions for each of the District's peer review assessment criteria (Appendix Tables 2-1, and 2-2).

## SUMMARY OF COMMENTS/QUESTIONS SUBMITTED BY DR. BILL DUNN

Dr. Dunn's review indicates that the District has done a commendable job in developing the proposed minimum flows. He agrees with basic assumptions, methods of data collection, much of the data analysis and presentation, and the development and selection of two minimum levels.

Dr. Dunn very strongly agrees with report's authors that whenever possible MFLs should be based on statistically defined protective hydrological events composed of 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.

However, managing uncertainty, which should be part of every MFLs setting process, is not addressed in an explicit and integrated approach in the District's report. Dr. Dunn believes the management of uncertainty is best accomplished as an adaptive management (AM) process and suggests that a comprehensive assessment of major sources of uncertainty and the magnitude of each source should be addressed in an explicit plan to manage the effects of uncertainty and reduce its impacts in the future using an AM approach.

A specific source of uncertainty in reviewing the recommended minimum levels for Lake Butler is the inability to check and validate most of the statistical analyses relied upon for summary and/or analysis of field data collected for ground elevation, vegetative communities, and soils. The lack of validation leaves the results presented open to question, and thus is a significant source of uncertainty. This omission should be corrected. The District's Lake Butler minimum levels report should include sufficient background information to assure that all statistical results presented can be verified by material in the main body of the report, or an appendix. In the bigger picture, verification of statistical results is also a quality assurance need that should covered.

One of the District's peer review assessment criteria, Item A.1.b in Appendices C and D asks the reviewers whether reasonable quality assurance assessments were performed on data and analyses. Dr. Dunn finds that the ECT report and the District's report lack comprehensive quality assurance (QA) components. Since QA is specifically addressed in Item A.1.b., Dr. Dunn recommends that a QA assessment be added to the ECT and District report. QA assessments could be integrated into a section of the report covering evaluation, characterization, and management of sources of uncertainty.

On the topic of adaptive management (AM), Dr. Dunn points out that by their very nature MFLs are adaptive strategies for management of the District's critically important water bodies. Each adopted MFL, as well as the District's entire MFLs program define an adaptive, learn as you go,

management strategy. The District would benefit from an explicit adaptive management approach that is based on identifying and addressing elements of uncertainty.

The field of AM has been developed over the last several decades specifically to deal with the effects of uncertainty in making and implementing resource management decisions, such as the management of water resources through MFLs. The basic tenets of AM are:

- All resource management decisions and resource management plans have elements of uncertainty; yet, management decisions must be made.
- Decisions should be made based on the best science, knowledge, and information available, while clearly identifying sources of uncertainty and accounting for their range of impact on predicted outcomes
- Uncertainty can be characterized, its effects can be described, and it can be managed, thus allowing prudent water resource decisions using the best available information.
- Monitoring of the condition of the resource of concern and its response to change is necessary in order to make better-informed future management decisions.

AM framework has become embedded in large ecosystem management and restoration programs for the Florida Everglades, Colorado River, California Bay-Delta program, Delaware River estuarine fisheries, and many other water resource management programs across North America. The framework for AM is a goal-seeking, six-step, adaptive feedback process as follows.

1. Assess the problem.
2. Design a solution.
3. Implement the solution's management plan (e.g. the minimum flows).
4. Monitor the resources of concern.
5. Evaluate resource health/condition, and develop resource management adjustments as needed.
6. Implement adjustments to the minimum flow regime.

As an example, an AM approach integrated into the minimum flow regime for Lake Butler would include:

- Use the proposed minimum flows as the initial condition, representing distillation of the best available information and analysis.
- Understand, describe, and quantify the sources of uncertainty affecting development of the minimum flows.
- Implement specific monitoring and compliance requirements that will reduce the effect of uncertainty and improve management decisions in the future.
- Collect and analyze monitoring data.
- Use data, analytical tools, and models to evaluate responses of resource values being tracked.
- Assess whether minimum levels are being met. If not, then revise relevant portions of the minimum flows.
- Implement changes to minimum flows as needed.

This AM approach can also encompass the District's MFLs compliance assessments done as part of both water use permitting decisions and the District's five-year water supply planning process. For MFLs, the congruence between the development of protective flows and levels for water bodies and the classic AM approach provides a framework for prudent use and protection of water resources while also providing goal seeking, adaptive strategies for dealing with uncertainty.

# SUMMARY OF COMMENTS/QUESTIONS SUBMITTED BY DR. DON RAO

The two reports reviewed by Dr. Rao, *Minimum Recommended Lake Levels: Lake Butler, Florida. Draft Report October* 2016, prepared by the District and *Lake Butler Water Budget Modeling-Phase B Technical Report-Final, prepared by ECT* are well organized and contain a comprehensive presentation of all the pertinent information. This reviewer, however, found several editorial type shortcomings in both reports and some concerns in the modeling methods and modeling results. Corrections and inclusion of additional information are suggested.

Dr. Rao raises several significant issues with a key part of the ECT report's analysis and conclusion. Dr. Rao finds that ECT was incorrect in finding that both minimum levels were being met in the baseline year of 2006. Dr. Rao contradicts this, finding that the FL is not being met under existing conditions. Dr. Rao mentions that ECT erroneously reached its conclusion based on a Pearson Type III statistical fit (Figure 5-8, ECT 2016) (Figure 1 in this report) and quoting Riggs (Figure 5, 1972), he explains, for low flow frequency analysis, a graphical curve (i.e., the best-fit line through the data) should be considered as the basic frequency curve and a statistical fit should be used only if it is a close fit of the data; a statistical fit may give misleading information otherwise. Dr. Rao draws attention also to the methods used by the SJRWMD. Robison 2014, page 33 Indicates:

> *If any pertinent point lies within the shaded box, the minimum level is being met.*

Otherwise, SJRWMD uses the best-fit line through the data (by inspection), and if the line passes through the shaded box it is concluded that the minimum level is being met (Robison 2014, Figure 21, page 42).

Dr. Rao points out, Figure 5-7 from the ECT report, for FH, shows that the data points fall well within the shaded area and the Pearson Type III is a close fit of the data. However, in Figure 5-8 (for FL), the Pearson Type III curve is not a best fit line of the data in the elevation range of 127.00 to 128.2 ft NAVD; the data points consistently lie below the fitted curve. Therefore, Dr. Rao drew a best fit line through the data (by inspection) and found that the plot misses the shaded box (see Dr. Rao's revised plot on the next page), which confirms Dr. Rao's conclusion.

If as Dr. Rao concludes, the FL is not being met under current conditions, then there is no more freeboard available in the UFA, and it may be that the water use is currently over-allocated. If upon further review this indeed is found to be true, then a prevention and/or recovery plan may be required.

Dr. Rao asks, in developing its MFLs, what kind of support SRWMD derived from the SWFWMD methods while it primarily used the methodology developed by the St Johns River Water Management District (SJRWMD) and suggests adding a paragraph in Section 4.0 MFLs Methodology to explain. Also, he finds Section 8.3 Deep Marsh Elevation to be too concise and suggests expanding.

Dr. Rao finds that the daily interpolated historic stage data that was used in developing the historic stage-duration curve (Figure 8-1, Page 21) will be of great help in performing further analyses. He strongly suggests performing MFLs compliance analysis using this historic stage data similar to the analyses he performed for the 107 SJRWMD MFLS lakes for compliance of MFLs (Rao 2005 Draft). The results will provide the crucial information as to where the modeled results stand compared to the results given by the historic stage data.

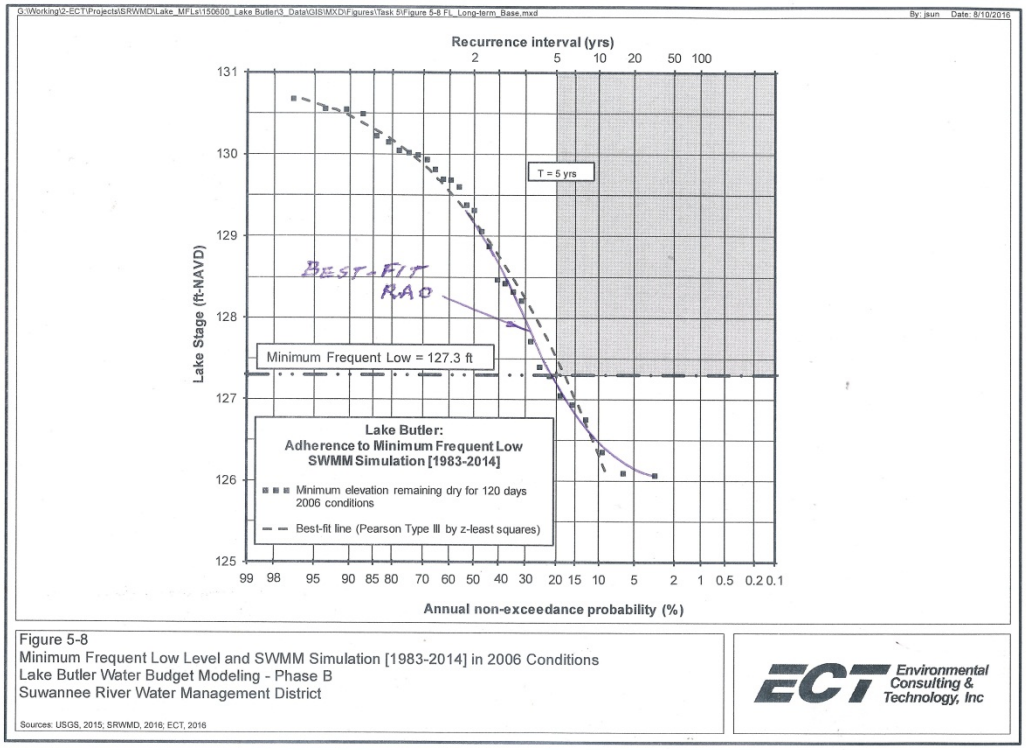


**Figure 1—ECT 2016 Figure 5-8**

In the ECT report, Dr. Rao finds the numbers shown on its Figure 4-10 shown below), Water Budgets of SWMM Simulation (2005-2014) (Figure 2 in this report), rather puzzling. Evaporation from water/lakes is shown as a low of 8.3 in/yr. and infiltration from land area a high of 36.6 in/yr., both values are unacceptable parameter estimates. Earlier, in its report Page 4-3, quoting Robison (2014), ECT states:

> *average evaporation for shallow lakes in the SJRWMD varies from 45 to 48 inches.*

Dr. Rao asks:

> *Will it not be about the same for SRWMD lakes?*

Dr. Rao finds that ECT well listed various water budget components found in the categories of Runoff Quantity, Groundwater and Flow Routing (ECT Report Page 4-14). To resolve the puzzling results found on its Figure 4-10 and to give the reader a feel for what the water budgets are in terms of magnitude, Dr. Rao suggests that ECT prepare a water budget table summarizing the average values for the calibration period. The summary table should include sub-basins (Column 1, Table 4-2 of the ECT Report) and aquifers (Column 1, Table 4-3 of the ECT Report).

The ECT modelers say:

> *Because SWMM can only model one Evapotranspiration (ET) time series data source, area-weighted daily PET (Potential ET) data was developed for the entire Lake Butler watershed, using the daily PET data at each of the pixels intersected with the watershed boundary.*

Dr. Rao suggests that ECT's procedure be illustrated by numerical values and suggests that ECT describe in detail how the series is applied in modeling.

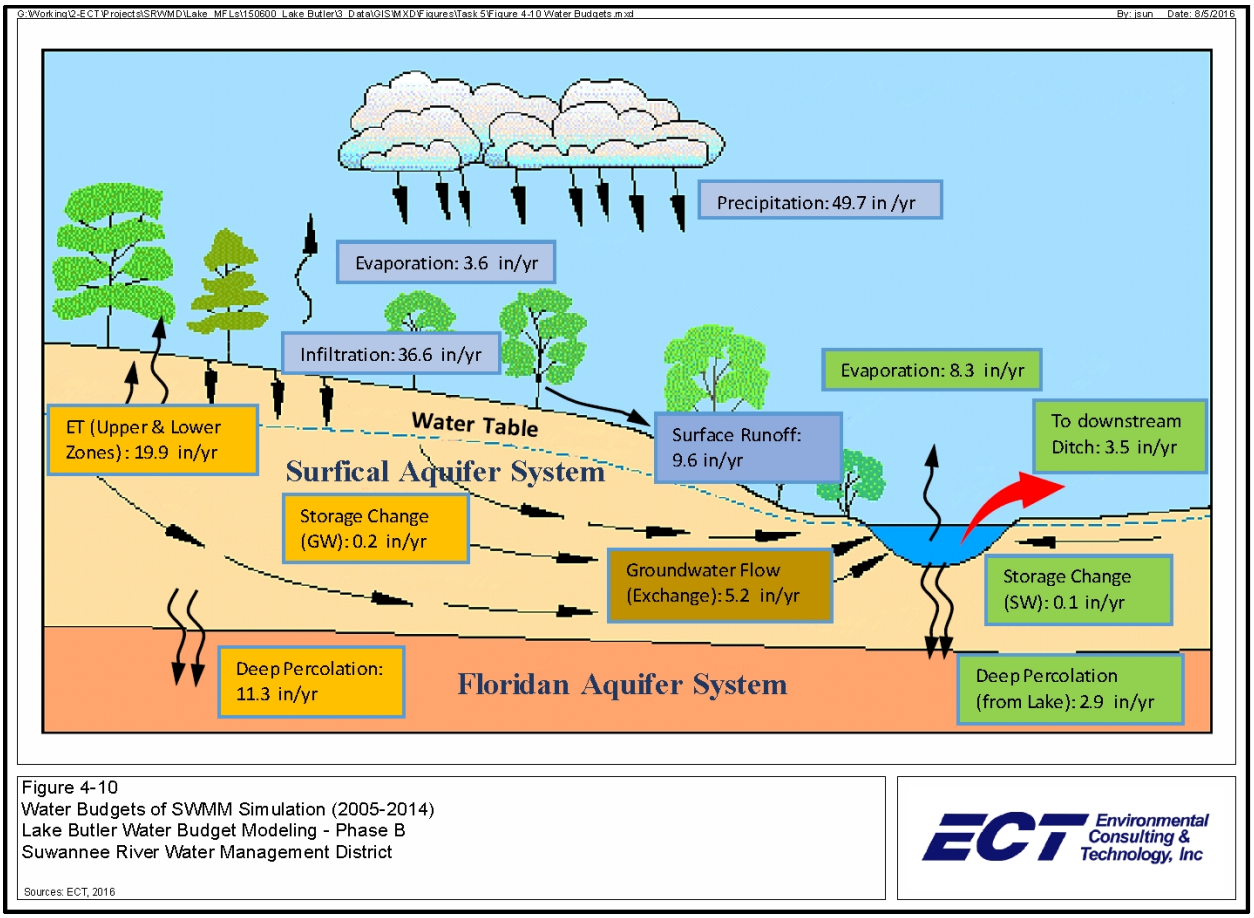


**Figure 2—ECT 2016 Figure 4-10**

Another important model parameter is percent impervious area of a sub-basin; this parameter determines the amount of runoff produced on a sub-basin and the infiltration that would take place. Dr. Rao suggests the use of caution in selecting the values of this parameter because reducing impervious area uniformly for all years may give biased results for some years (e.g., may increase infiltration). He questions whether there is a provision in the model to vary impervious surface by year? For example, lower impervious area could be used during low rainfall years, and keep higher during other years.

Finally, on the ECT model results and model calibration, Dr. Rao says,

> *Whether the model was well calibrated can be determined after the additional results I suggest are produced*.

Dr. Rao draws attention also to the Atlantic Multidecadal Oscillation (AMO), which is regarded as indicative of the cyclical patterns of south and central Florida rainfall. AMO has warm and cool phases, the warm phase indicating generally higher rainfall and the cool phase lower rainfall (Enfield et al. 2001). The graphic presented Figure 3 shows the historic phases of the AMO. AMO represents 10-year moving averages of North Atlantic Sea Surface Temperature. Thus, the last point on the graph is the midpoint of the current decade, 2011.

Kelly and Gore (2008) of SWFWMD studied the effects of AMO on peninsular Florida river flows and rainfall in the context of MFLs. They emphasize the importance of selecting an appropriate baseline flow period (for MFLs analysis) and suggest that it may be appropriate to have at least two baseline periods; one based on a wet period and one based on a dry period.' They also state,

> *These results have important implications not only for the establishment of ecological flows, but also for water supply planning and development, flood control and stream ecology in general, since there are considerable differences in the magnitude of flows that should naturally be expected between multidecadal periods. Relatively large decreases and increases in flow are attributable to rainfall differences between multidecadal periods.*

SRWMD's entire long term simulation period (1983-2014) falls in a warm phase, indicating thereby it is generally a wet phase (Figure 3). Dr. Rao suggests calculating the mean annual rainfall values for 1983-2014 for the nearby stations (Gainesville, Starke, and Lake City) and for the period 1951-1982, and comparing the two values. If the rainfall patterns followed AMO, 1951-1982 would be relatively a dry phase. At SJRWMD, Dr. Rao completed a comprehensive report on AMO and found that there is a strong qualitative resemblance between AMO and the rainfall and streamflow patterns of Northeast Florida (Rao 2008 Draft). To illustrate this finding, four figures from Dr. Rao's report comparing AMO with rainfall patterns of Gainesville and streamflow flow patterns of the St. Johns River near Christmas are presented as Figures 4 through 7). In these figures, NAWR represents North Atlantic Warm Region (see Figure 8), a region where most of the North Atlantic hurricanes occurred, and Dr. Rao developed a separate Multidecadal Oscillation (MO) for this region.

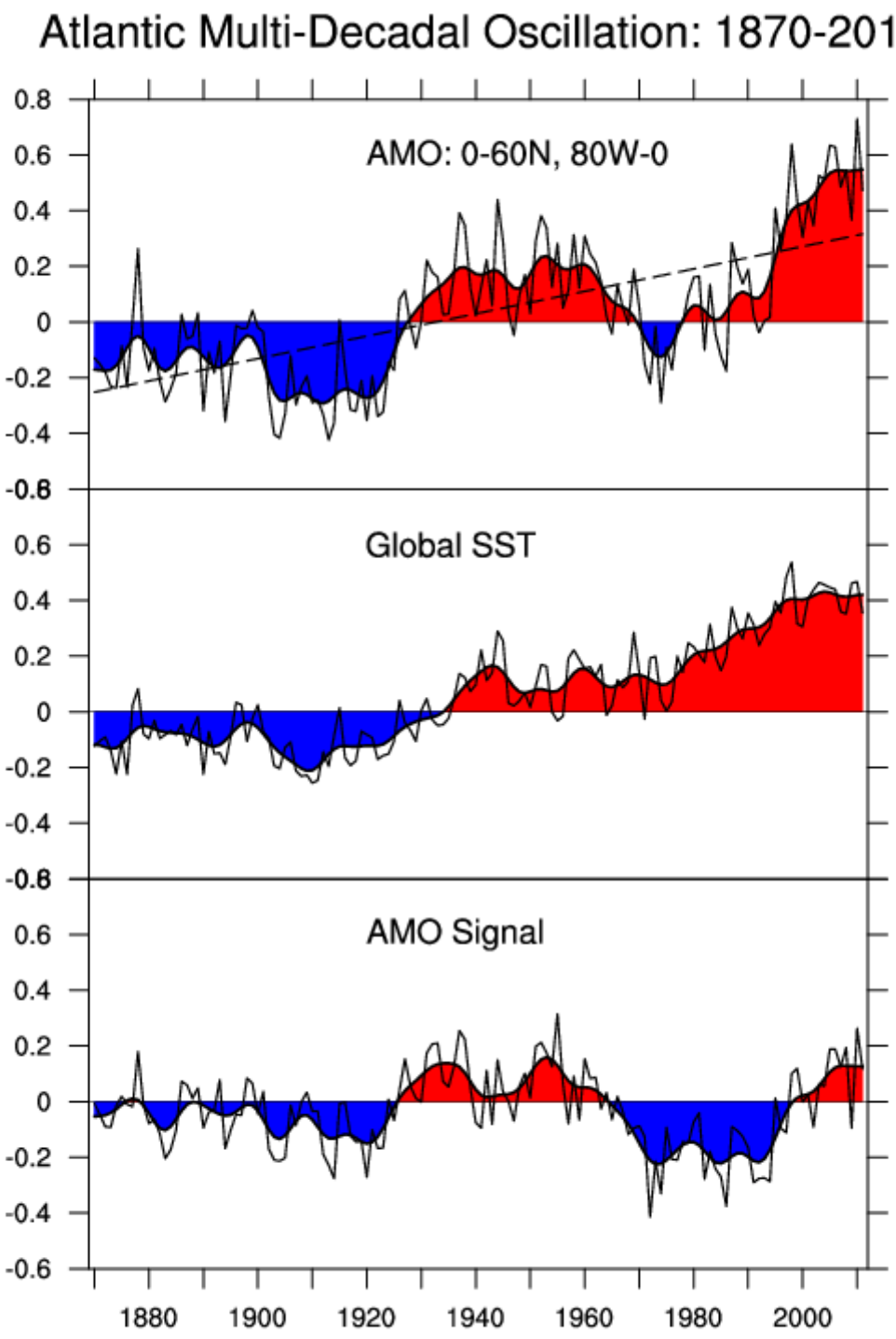


**Figure 3—Atlantic Multidecadal Oscillation**

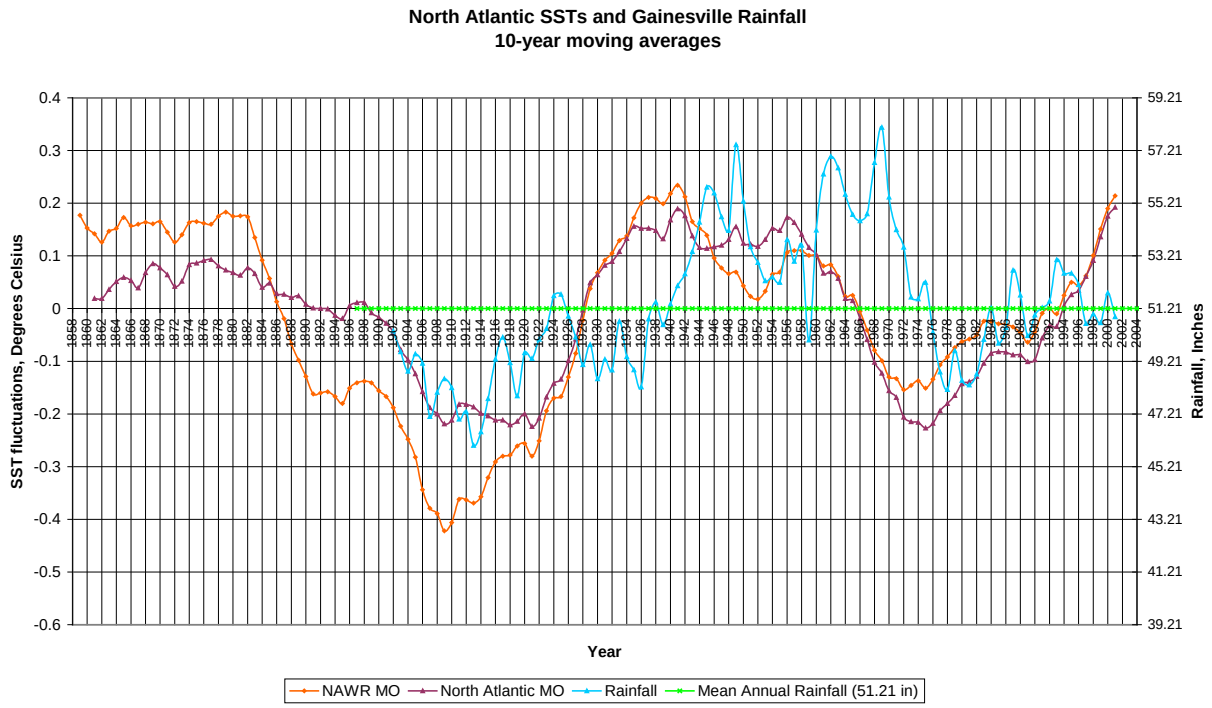


**Figure 4—Gainesville 10-Year Moving Average**

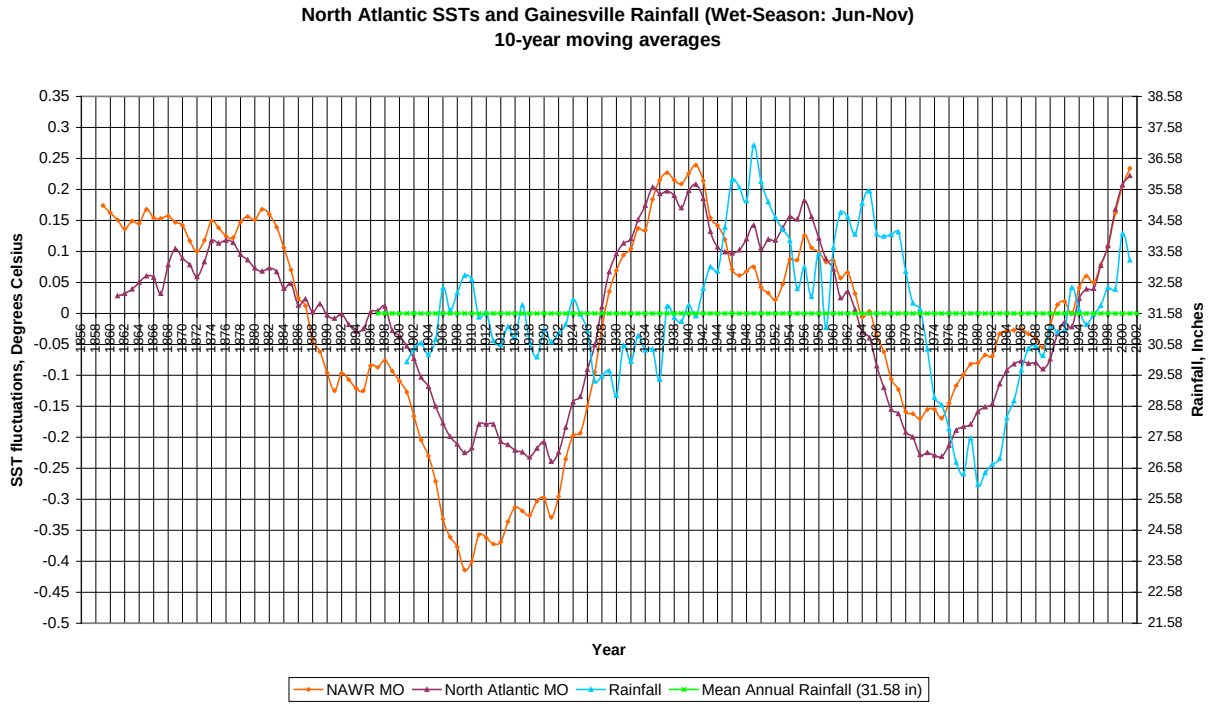


**Figure 5—Gainesville Wet Season 10-Year Moving Average**

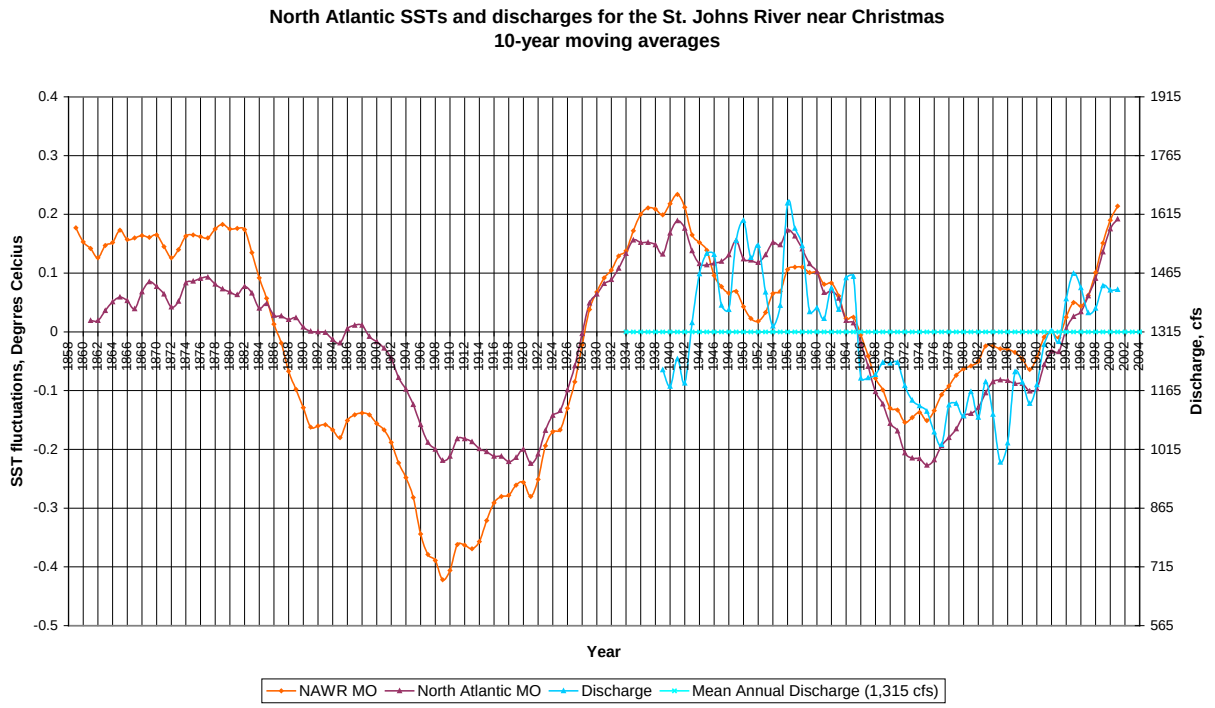


**Figure 6—St. Johns River Near Christmas 10-Year Moving Average**

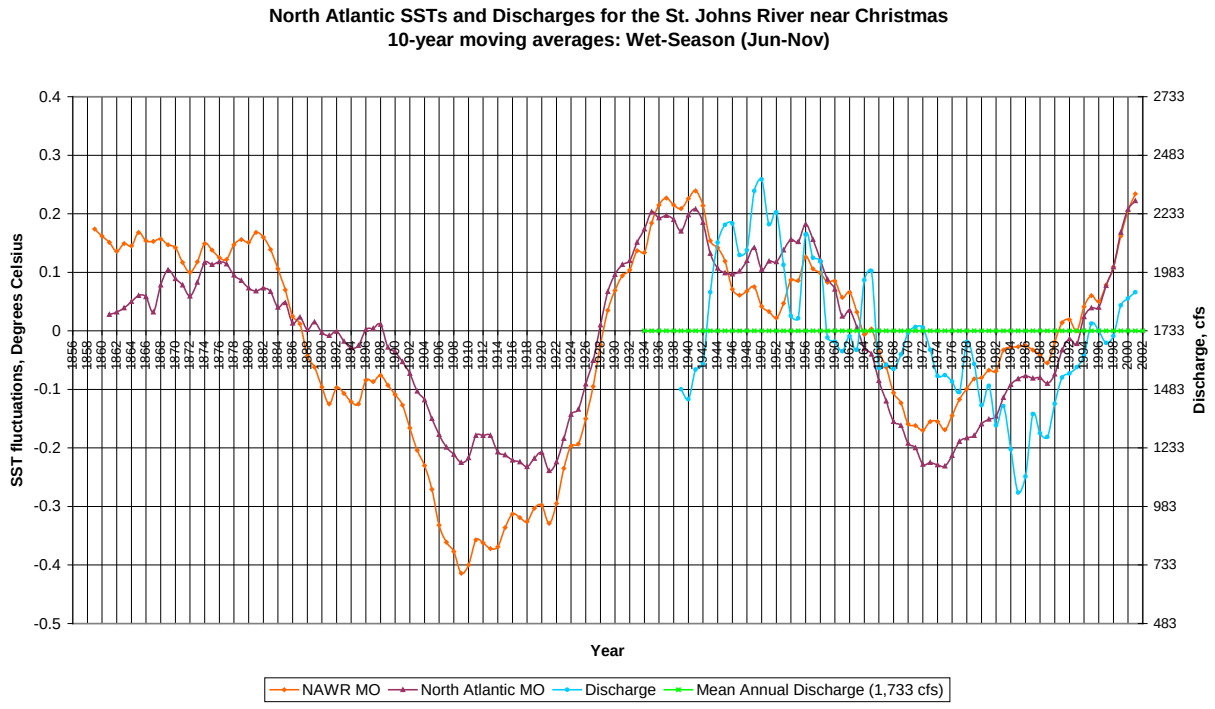


**Figure 7—St. Johns River Near Christmas Wet Season 10-Year Moving Average**

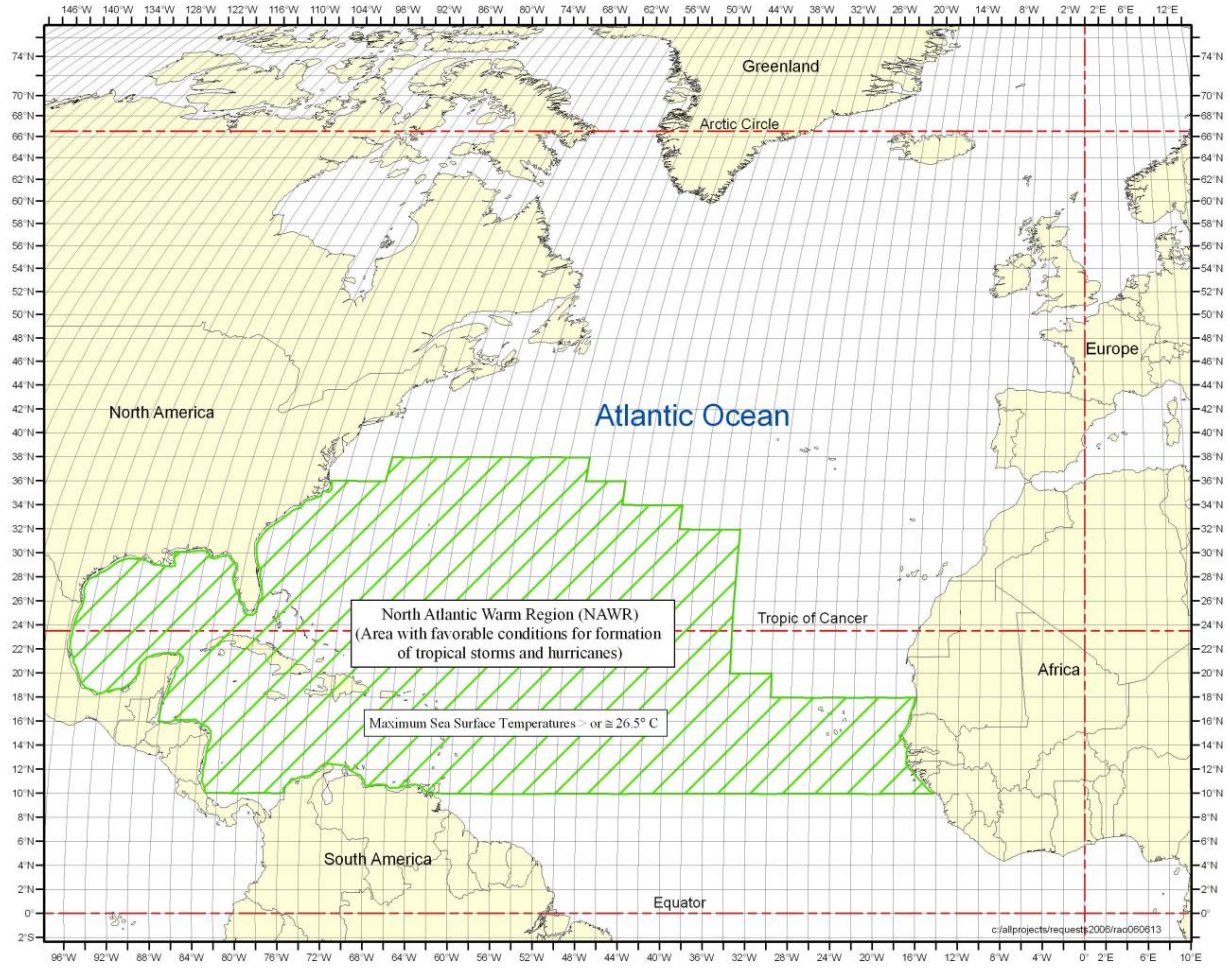


**Figure 8—North Atlantic Warm Region**

# COMBINED SUMMARY OF MAJOR PEER REVIEW COMMENTS

The peer reviewers find that most, but not all, of the conclusions in the two MFL reports are supported by the analyses presented. The reviewers generally concur with data and information collected, the data collection methods, the methods used for analysis and interpretation, and the two minimum levels recommended. They do however, disagree with the compliance assessment for the FL. They also suggest that additional work be done to address two important issues: 1) quality assurance, and 2) the management of uncertainty.

The reviewers strongly agree with the District report's authors that whenever possible MFLs should be based on statistically defined protective hydrological events composed of: 1) a magnitude (flow and/or level), 2) continuous duration for the specific inundation or drying period, and 3) with a return interval.

The interpreted results of hydrologic indicators greatly help interpret the magnitude of soils subsidence. The hydrologic indicator analysis helps greatly to characterize the magnitude of the drainage effect of the outlet canal. The discrepancy between the current flood regime in the forested wetlands and its historic indicators is significant, and should be investigated further in the future. The peer reviewers conclude that the report should give greater emphasis to the changed conditions induced by the outlet canal.

Regarding the compliance assessment for the FL, Dr. Rao recommends a preferred approach for fitting a line to the data in the Weibull probability plots. In doing this himself, Dr. Rao concluded that the FL is not being met under year 2006 conditions. Dr. Rao gives specific instructions for reanalyzing the FL, and he has provided his own analysis in Figure 1. If, as Dr. Rao concludes, the FL is not being met under current conditions, then there is no more freeboard locally available in the upper Floridan aquifer, and it may be that the water use is currently over-allocated. If upon review of this conclusion by the District, this proves to be the case, then a prevention and/or recovery plan may be required.

In light of Dr. Rao's finding that the FL is not met under current or future conditions, the peer reviewers ask what hydrologic factors cause or contribute to this potential violation of the minimum level. If Dr. Rao's finding that the FL is not being met under current conditions is confirmed, then the District should next investigate the causal factors. The District's report suggests that current and historic hydrologic conditions controlling the lake basin's water budget do not indicate significant changes in the land use, runoff characteristics, basin alterations, surface water withdrawal, or regional groundwater use. The reviewers note that if Dr. Rao's finding is confirmed, then the District will be required by rule to develop a recovery and/or prevention plan to address causal factors, and develop specific strategies to reduce the source(s) of hydrologic stress on the Lake Butler ecosystem.

The reviewers recommend that two topics be added to the document. The two topics are intimately linked; they are the management of uncertainty and the adoption of an explicit adaptive management approach to using the minimum levels to manage the health of the Lake Butler ecosystem. However, managing uncertainty, which should be part of every MFLs setting process, is not addressed in an explicit and integrated approach in the District's report. Dr. Dunn believes the management of uncertainty is best accomplished as an adaptive management (AM) process and suggests that a comprehensive assessment of major sources of uncertainty and the magnitude of each source should be addressed in an explicit plan to manage the effects of uncertainty and reduce its impacts in the future using an AM approach.

One of the District's peer review assessment criteria, Item A.1.b in Appendices C and D asks the reviewers whether reasonable quality assurance assessments were performed on data and analyses. The reviewers found that the ECT report and the District's report lack comprehensive

QA components. Since QA is specifically addressed in Item A.1.b, then the reviewers recommend that staff add QA assessments to the District's MFLs report. QA assessments could be integrated into a section of the report covering evaluation, characterization, and management of sources of uncertainty.

On the topic of AM, Dr. Dunn points out that by their very nature MFLs are adaptive strategies for management of the District's critically important water bodies. Each adopted MFL, as well as the District's entire MFLs program define an adaptive, learn as you go, management strategy. The District would benefit from an explicit adaptive management approach that is based on identifying and addressing elements of uncertainty.

# REFERENCES

Enfield, D.B., A.M. Mestas-Nunez, and P.J. Trimble, 2001: *The Atlantic Multidecadal Oscillation and its relationship to rainfall and river flows in the continental U.S*. *Geophysical Research Letters*, *28*: 2077-2080.

Kelly, Martin H., James A. Gore (2008). *Florida River Flow Patterns and the Atlantic Multidecadal Oscillation. River Research and Applications*, 24:598-616 (2008). Published online in Wiley Interscience (www.interscience.wiley.com) DOI: 10.1002/rra.1139

Rao, D. V., 2005 Draft. *Verification of Minimum Surface Water Levels for Lakes in the Minimum Flows and Levels Program of the St. Johns River Water Management District*. Palatka, Fla.: St. Johns River Water Management District.

Rao, D. V., 2008 *Draft. North Atlantic Sea Surface Temperatures and Rainfall/ Streamflow Occurrences in NE Florida*. Palatka, Fla.: St. Johns River Water Management District.

Riggs, H. C. 1972. *Low-Flow Investigations, Techniques of Water-Resources Investigations of the United States Geological Survey*, Chapter B1, Book 4 Hydrologic Analysis and Interpretation. Washington D.C.: U.S. Government Printing Office.

Robison, C.P. 2014. *Indian Lake System Minimum Flows and Levels Hydrologic Methods Report*. Technical Publication SJ2014-2. Palatka, Fla.: St. Johns River Water Management District.

# APPENDICES

# Appendix A
# Table 1-1. Dunn Review Comments on MFL Documents

# TABLE 1-1. DUNN REVIEW COMMENTS ON MFL DOCUMENTS

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 1 | General comment | No | Report needs to have an integrated treatment of the sources of uncertainty | Add a discussion on the effect of sources of uncertainty on the development of the recommended minimum levels. | |
| 2 | General comment | No | Report should have a concise assessment of how each of the relevant water resource and human use criteria (from statute) are addressed by the recommended minimum levels. | This can be handled best in a tabular format. SJRWMD typically include a summary table in their MFL documents. | |
| 3 | General comment | Maybe yes | Statistical analyses are not covered in sufficient detail. For the most part results are given in the report, but the details of the analysis are not provided. Therefore, the results of any statistical analysis is only assumed to be valid. | The Lake Butler minimum levels report would be aided by a thorough review to assure that all statistical results presented can be verified by material in the main body of the report, or an appendix.<br>In the bigger picture, verification of statistical results is also a quality assurance need that should covered. Finally, the lack of verification make the statistical results a specific source of uncertainty. | |
| 4 | General comment | No | Adaptive management theme should be added. | The adaptive management theme can be introduced in the analysis of uncertainty as covered in Comment 1, above. | |
| 5 | Pages 2-3, Section 2.3 Hydrologic Regime | No | Reviewer concurs with the use of the MFLs methods developed by SJRWMD, supplemented by lake MFLs methods developed by SWFWMD. | No further action required. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 6 | Pages 5, Section 2.4 Management Concerns | No | Staff highlight this concern, but do not give the reader a clear picture as to the relevance of this particular MFL to the water supply planning process. | Can staff expand on the importance of the NFRWSP? Add additional information to this short paragraph. | |
| 7 | Page 5, first paragraph | No | Reviewer agrees with basic approach as described. | No further action required. | |
| 8 | Page 5, Section 3.1 Lake and Basin Morphometry. | No | When did the outlet canal become operational? It would be helpful to readers to know when this outlet control became operational. | Add the relevant information. | |
| 9 | Pages 5-8, Section 3.1, Figure 3-3. | No | Is there any literature describing the forested areas to west, north, and northeast of lake as being supported by lateral seepage of shallow groundwater? | Add the relevant information if available. | |
| 10 | Page 9, Section 3.2 Hydrologic Record | No | The reviewer acknowledges that the lake level time series is not robust, being based on monthly to weekly values. We concur with ECT's approach to develop interpolated daily lake level values? | No further action required. | |
| 11 | Page 9, Section 3.2 | No | The reviewer agrees that the period of record (POR) developed, and the data and analysis used was the best available. | No further action required | |
| 12 | Page 9, Table 3-2 | No | The heading Column 2 is listed as weekly readings, but the table's title mentions monthly. Is there discrepancy here? | Clarify and correct as needed. | |
| 13 | Page 10, Figure 3-4. | No | The figure should have a legend. | Add a legend to the figure. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 14 | Page 11, Figure 3-5 | No | There is a section shown as non-hydric in the extensive wetland on the southwest side of the lake. On Figures 3-3 and 3-4 the area is mapped as wetland. Are the soils depicted correctly as non-hydric? | Clarify and correct as needed. | |
| 15 | Page 11 text in first two paragraphs | No | Are any of these soils associated with bayhead or baygall communities? My experience has been that extensive forested wetland systems adjacent to lakes that are dominated by bay trees are often fed by lateral seepage of shallow groundwater from adjacent upland ridges. | If there any relevant information on the significance of the seepage flows into these wetlands, then please add a brief discussion to clarify. | |
| 16 | Page 12, Section 4.0 MFLs Methodology, first paragraph | No | Is the 2006 reference the most current version of the SJRWMD's MFL Methods Manual? | Revise text as needed. | |
| 17 | Page 12, Section 4.0 MFLs Methodology, second paragraph | No | The reviewer concurs with the use of the MFLs methods developed by the SJRWMD, supplemented by lake MFL methods developed by SWFWMD. | No further action required. | |
| 18 | Page 12, Section 4.1 Site Selection | No | The reviewer concurs with sampling site selection process, as described | No further action required. | |
| 19 | Page 14, Section 4.2 Site Survey | No | The reviewer concurs with site survey and data collection methods, as described. | No further action required. | |
| 20 | Page 15, Section 4.3 Vegetation Sampling | No | The reviewer concurs with vegetative community sampling and data collection methods, as described. | No further action required. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 21 | Pages 15, Section 4.3 | No | Regarding the decision to focus on the deep marsh community using the cow-lily (Nuphar luteum) was the edge of the maidencane (Panicum hemitomon) line considered? During our field survey of the lake, the maidencane zone looked to be quite a prominent feature of the deep marsh community. | Explain. Is this something that may warrant tracking in the future? | |
| 22 | Page 15-16, Section 4.4 Soils Sampling | No | The reviewer concurs with soils sampling and data collection methods, as described. | No further action required. | |
| 23 | Page 16, Section 4.5 Hydrologic Indicator Sampling | No | The reviewer concurs that the using the SWFWMD hydrologic indicators was a very useful exercise, supplementing the SJRWMD methods. | No further action required | |
| 24 | Page 16, Section 5.0 Data Analysis | No | The reviewer concurs with District staff's decision to use the average elevation of the basin swamp as the estimate of the FH, and the average elevation of the landward extent of the deep marsh as the estimate of the FL. These choices align with the SJRWMD methods. | No further action is required. | |
| 25 | Page 17 Section 6.0 Consideration of Basin Alterations, last paragraph in section | No | The reviewer agrees with staff's decision to treat current conditions of vegetation and soils as the valid basis for developing protective levels for Lake Butler | No further action required. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 26 | Page 17, Section 7.0 MFLs Compliance Assessment, first paragraph | No | The Reviewer agrees with the report's authors that the Lake Butler water budget model is the best tool for assessing MFL compliance of any proposed water management action in the lake basin. | No further action required. | |
| 27 | Page 18, Section 8.1 Vegetation, last paragraph | No | The reviewer agrees with staff's conclusion that there is no evidence of disturbance that would result in invasion of less flood tolerant plant species. | No further action required. | |
| 28 | Page 19, first full paragraph | No | The reviewer agrees with District staff's stated conclusion that a quantitative sampling was done to characterize the wet to mesic pine flatwoods community. | Further investigation and data collection in the flatwoods along the existing transects would be warranted if lateral groundwater seepage is shown in the future to provide a significant contribution to maintenance of the hydrologic soils and vegetation in the wetlands bordering the lake, then additional data collection in the flatwoods may be warranted in the future | |
| 29 | Page 19, Section 8.2 Determination of Basin Swamp Elevation | No | The reviewer agrees with the methodology and result of the determination of the basin swamp elevation. | No further action required | |
| 30 | Page 20, Section 8.3 Deep Marsh Elevation | No | The reviewer generally agrees with the methodology and result of the determination of the deep marsh elevation with the caveat that the description of the outlier analysis and removal is incomplete as described in Appendix C. | In Appendix C provide a more complete description of method used to delete outliers. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 31 | Page 20, Section 8.4 Soils, second paragraph | No | The report's authors state that replicated elevation control is lacking. This is source of uncertainty. Is this a significant source of uncertainty? Can replicated control be obtained in the future? | Describe the effect of this uncertainty, if any, on the conclusions reached for the recommended minimum levels for Lake Butler. | |
| 32 | Page 20 to 21, Section 8.5 Hydrologic Indicators | No | This is a good part of the chosen MFLs setting approach. With data collected to support both methods, then staff can compare/contrast results from SJRWMD methods vs those from SWFWMD. Reviewer would like to see a bit more comparative analysis to characterize how well the two approaches agree, or disagree.<br>For example, consider a comparison of P50 estimates between methods. The two are very close (129.19 from POR, 128.97 by SWFWMD). | Add an expanded comparison. | |
| 33 | Pages 21 to 23, Section 9.0 Conclusions and Recommendations | No | The reviewer finds that the recommended minimum levels for Lake Butler have been developed using best available data sources and analytical methods. However, several questions remain. | No further action required. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 34 | Page 21, Section 9.0 Conclusions and Recommendations | Maybe | The reviewer finds that the recommended levels are supported by the methodological approaches applied, and data collection, analyses, and modeling. However, several questions remain about the water model developed and used by ECT. In particular, Dr. Rao has raised significant questions regarding ECT's modeling and compliance analysis. These are included in Dr. Rao's comments in Appendix B Table 1-2, and Appendix D Table 2-2. | Questions raised by Dr. Dunn and Dr. Rao need to be resolved. Treat the agreement given in this comment as tentative until questions and issues are resolved. | |
| 35 | Page 22 Table 9-1 | No | The reviewer agrees with the two recommended hydrologic events (magnitude, duration, return interval) recommended as the minimum levels for Lake Butler | No further action required. | |
| 36 | Page 22 last paragraph | Maybe | The reviewer agrees with conclusion regarding the designation of year 2006 baseline condition against which compliance assessments can be compared for compliance. However, several questions remain. In particular, Dr. Rao has raised significant questions regarding ECT's modeling and compliance analysis. These are included in Dr. Rao's comments in Appendix B Table 1-2, and Appendix D Table 2-2. | Questions raised by Dr. Dunn and Dr. Rao need to be resolved. Treat the agreement given in this comment as tentative until questions and issues are resolved. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 37 | Page 23 | Yes | The reviewer does not agree with this compliance assessment for available freeboard relative to changes in the upper Floridan aquifer. Several questions need to be resolved about ECT's compliance assessment. In particular, Dr. Rao has raised significant questions regarding ECT's modeling and compliance analysis. These are included in Dr. Rao's comments in Appendix B Table 1-2, and Appendix D Table 2-2. | Questions raised by Dr. Dunn and Dr. Rao need to be resolved. Treat the agreement given in this comment as tentative until questions and issues are resolved. | |
| 38 | Page 23 | Yes | In light of the Dr. Rao's finding that the FL is not met under current, or future conditions reviewer asks what hydrologic factors cause or contribute to this potential violation of the minimum level? | If Dr. Rao's finding that the FL is not being met under current conditions is confirmed, then the District must also investigate the causal factors. The report suggests that current and historic hydrologic conditions controlling the lake basin's water budget do not indicate significant changes in the land use, runoff characteristics, basin alterations, surface water withdrawal, or regional groundwater use.<br>Of course, if Dr. Rao's finding is confirmed, then the District will be required by statute to develop a recovery and/or prevention plan which would address causal factors, and specific strategies to reduce the source(s) of hydrologic stress on the Lake Butler ecosystem. | |
| 39 | Appendix B: Site Survey | No | I found the information presented in Appendix B to be clearly presented and easy to follow. | No further action required. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 40 | Appendix C: Vegetation Sampling Methods, Analyses, and Results | No | I agree with the plant community sampling methods selected and applied. | No further action required. | |
| 41 | Page 38 first paragraph | No | Is Nuphar zone a good choice for deep marsh? What about the maidencane zone? In the first sentence the authors state that the lake's shoreline is heavily dominated by maidencane. I noticed this too during our field survey | Provide a more detailed explanation as to why the Nuphar zones, as opposed to the maidencane zones, were selected for sampling | |
| 42 | Page 39, last sentence in the first full paragraph | No | Authors mention that the high density of small diameter trees is often indicative of timber harvesting. Is there evidence of timber harvesting in floodplain community? | Add text too clarify. | |
| 43 | Page 40 | No | There is an incomplete tabular summary at top of page. Does it belong? | Edit (delete or revise) this as needed. | |
| 44 | Page 40, Table C3 | No | Typo in line for Pond cypress—change the comma to a right paren. | Please make correction | |
| 45 | Page 46 paragraphs 2 and 3. | Maybe | The handling of outliers needs to be enhanced. The text does not state by what statistical metric the four data points were eliminated. In particular, the report needs a clearer explanation of how the normal Q-Q plot in Figure C3 informs the elimination of the four data points. | Add a clearer explanation of how the normal Q-Q plot in Figure C3 informs the elimination of the four data points. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-1, Dunn | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 46 | Lake Butler Water Budget Modeling—Phase B | Maybe | I defer to Dr. Rao's' review of ECT's efforts to develop the water budget model. Please see Appendix B Table 1-2. | Make appropriate revisions | |

# Appendix B
# Table 1-2. Rao Review Comments on MFL Documents

# TABLE 1-2. RAO REVIEW COMMENTS ON MFL DOCUMENTS

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 1 | General | No | The two reports, *Minimum Recommended Lake Levels: Lake Butler, Florida. Draft Report October* 2016by and *Lake Butler Water Budget Modeling – Phase B by ECT* are well organized and all the pertinent information was comprehensively presented. This reviewer, however, found several editorial type shortcomings in both reports and some concerns in the modeling methods and modeling results. Corrections are suggested and additional information requested. | Implement reviewer's editorial corrections suggested in this table. Provide requested results from modeling. | |
| 2 | Page ii | No | Appendix A is left blank | Describe what is included in Appendix A. Is it the ECT report itself or a link to the report? | |
| 3 | General | No | There are too many acronyms in the report, need a table of acronyms | Before the Executive Summary provide a list of acronyms | |
| 4 | Page 1, Summary Table | No | This table is referred to as Table 1 in the text | Change 'Summary Table' to Table 1 in the table title | |
| 5 | Page 1, Para 2 | No | The reference SJRWMD 2006 appears to be not yet a published report, it cannot be found on the SJRWMD website. | Show it as, SJRWMD 2006 (Draft) | |
| 6 | Page 1, Para 3 | No | The statement: 'The minimum frequent high stage for a seasonally flooded hydroperiod represents the average land surface elevation in the basin swamp adjacent the lake.' The reason for this statement is not clear. | Explain why you want to identify FH as the 'average' land surface elevation. Average in what sense? | |

| | | | | | |
|---|---|---|---|---|---|
| 7 | Page 2, Para 3 | Yes | The statement: Based on the model results using a long-term simulation period from 1983 through 2014, SRWMD concludes that the draft recommended MFLs for Lake Butler are protected under current conditions.<br>It appears this conclusion is based on Figures 5-7 and 5-8 from the ECT (2016) report, 'Lake Butler Water Budget Modeling – Phase B.' Specifically, from the Pearson Type III statistical fits of SWMM simulation data points for Minimum Frequent High (FH) and Minimum Frequent Low (FL) levels of Lake Butler.<br>For low flow frequency analysis, a graphical curve (i.e., the best-fit line through the data, by inspection) should be considered as the basic frequency curve and a statistical fit should be used only if it is a close fit of the data; a statistical fit may give misleading information otherwise (Riggs 1972). I also draw attention to the methods used by the SJRWMD. 'If any pertinent point lies within the shaded box the minimum level is being met (Price Robison 2014, page 33).' Otherwise, SJRWMD uses the best-fit line through the data (by inspection), and if the line passes through the shaded box it is concluded that the minimum level is being met (Price Robison 2014, Figure 21, page 42).<br>Figure 5-7 from the ECT report, for FH, shows that the data points fall well within the shaded area and the Pearson Type III is a close fit of the data. However, Figure 5-8 for FL reveals that Pearson Type III curve is not a best fit line of data in the elevation range of 127.00 to 128.2 ft NAVD; the data points consistently lie below the fitted curve. Even though Pearson Type III curve passes through the shaded area, the data points lie away from the shaded area. This reviewer drew a best fit line through data (by inspection) and the line misses the shaded box. For these | Review stage-area-storage data of the lake and see if an explanation can be found as to why stages simulated were lower for the elevation range indicated. Does the lake have relatively large area in this range? How many observed stage data points are there in this range? Revise stage-area-storage data if errors are found and re-run the model.<br>In 2005, this reviewer produced a MFLs verification report that evaluated MFLs for all of the 107 lakes in the SJRWMD MFLs program (Chapter 40C-8, F.A.C.) using the then available historic data (Rao 2005 Draft). In general, daily historic stage data had gaps, and these gaps were filled by a linear interpolation of the available data, regardless of the lengths of the gaps. Develop daily historic stage data for Lake Butler by this method, run a double mass analysis to check for data consistency. Perform MFLs evaluation using the interpolated stage data for Lake Butler by the procedures used by Rao (2005 Draft).<br>If the MFLs graphs by the historic data show that the established MFLs are met, review the model input data and assumptions and revise the model as necessary.<br>If the established FL for Lake Butler is not met by the historic data, consider re-evaluating the established MFLs and revise them accordingly. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| | | | reasons, this reviewer concludes that the established Minimum Frequent Low level (FL) for Lake Butler is not met by the simulated data. | | |
| 8 | Pages 4-5, Hydrologic Regime | No | Hydrologic Regime section describes the MFLs methodologies of the SJRWMD and SWFWMD and in the introduction, it was stated that SRWMD developed its MFLs based on the methodologies of these two districts. Since SRWMD borders these two districts, its hydrology may not be different from these two districts; therefore, SRWMD developing its own MFLs based on the neighboring District's methodologies is justified. | No further action required. | |
| 9 | Page 4, Hydrologic Regime | No | The reference (SJRWMD 2009a).<br>This reference is not found in the References list (Pages 24 – 26). But Table 2-1 is from SJRWMD 2006 Draft | Revise SJRWMD 2009a as SJRWMD 2006 Draft | |
| 10 | Page 4, Table 2-1 | No | Table 2-1 information may not be current. Current information is available in<br>Chapter 40C-8 F.A.C. (January 31, 2016). I checked for "Permanently flooded" category. It is defined as: "Permanently flooded" means a hydroperiod category where water covers the land surface throughout the year in all years. Vegetation, if present, is composed of aquatic macrophytes.<br>The above definition means: Frequency every year, and duration 'year long.' | SRWMD staff should check Chapter 40C-8 F.A.C. (January 31, 2016), and find out the values of frequency and duration for Table 2-1. or make a comment: Table 2-1 frequency and duration description/values may not be current, current information may be found in Chapter 40C-8 F.A.C. (January 31, 2016). | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 11 | Page 5, first paragraph | No | This paragraph gives a general description of how MFLs are applied. If a proposed consumptive use leads to violation of the adopted MFLs will the permit application be denied? Can you give instances of when and why it would be necessary to review and revise the established MFLs? | Address this question and add text as necessary | |
| 12 | Page 5, Management Concerns | No | The importance of the NFRWSP to the proposed MFLs is not clear? | Add explanation of the importance. | |
| 13 | Page 5, Section 3.1 Lake and Basin Morphometry | No | The date when the outlet canal become operational should be added. | Add the requested information and additional text as necessary | |
| 14 | Page 5, last Para | No | The report includes the following text -The lake occupies. This wording is awkward. | Revise it as: The lake has an area of | |
| 15 | Pages 5-8, Section 3.1 | No | Is there any literature describing the forested areas to west of lake as being supported by lateral seepage of shallow groundwater? | Address the question and add appropriate text | |
| 16 | Page 7, | No | Appendix X: Is it a part of this report. | Explain where Appendix X is located | |
| 17 | Page 7, second sentence from bottom | No | The report includes the following text -The inflow is dominated by. This wording is awkward. | Revise it as: The inflow is predominantly | |

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| 18 | Page 7, last line | No | The report includes the following text - sub-basins are dominated by extensive wetlands. This wording is awkward | Revise it as: sub-basins are extensive wetlands | |
| 19 | Page 7, Figure 3-2 | No | It is not clear how the bathymetry lines were developed? | Describe how the bathymetry lines were developed. | |
| 20 | Page 9, Paragraph 1 | No | The statement in lines 3-4: ECT provided a temporally-interpolated lake stage dataset, should be improved upon. | Revise it as: Lines 3-4: ECT computed a temporally-interpolated lake stage dataset | |
| 21 | Page 9, Section 3.2 Hydrologic Record | No | The historic stage data were aperiodic, and ECT estimated the missing data by interpolation. This can be accepted. | No change recommended | |
| 22 | Page 9, Section 3.2 | No | The daily values aggregated to monthly for the period of record (POR) may be regarded as the best available data. | No change recommended | |
| 23 | Page 9, Table 3-2 | No | Column 2 is listed as weekly readings. If this is true, An explanation of the approach for calculating weekly values should be included The table title says monthly means were used. | Revise as necessary | |
| 24 | Page 9, Table 3-2 | No | Are the stages P10, P50, and P90 shown in the table in anyway related to the recommended Lake Butler MFLs? | Address this question and change as appropriate | |
| 25 | Page 9, | No | The first sentence.<br>Is there a figure that shows the gage location? | Show the gage location in one of the figures and reference that figure. | |
| 26 | Page 9, Line 5 | No | (Figure 3-2, Appendix A) is not a correct reference. | Appendix A you are referring to is actually ECT 2016. Wherever you refer to the ECT report, show it as ECT 2016 instead of Appendix A | |

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| 27 | Page 10, Figure 3-4. | No | The six bullets at the top of the page describe various wetlands found in the basin and are designated as PFO6F, PFO4C, etc. It would be helpful to know what these letters stand for, i.e., How did you get this acronym? | Add a legend to the figure. | |
| 28 | Page 12, Section 4.0 MFLs Methodology | No | In the Introduction, it is stated, SRWMD established its MFLs using the methodology developed by the St Johns River Water Management District (SJRWMD) and supported by methods developed by the Southwest Florida Water Management District (SWFWMD).<br>Nowhere in the report it is clarified what kind of support SRWMD derived from the SWFWMD methods. After the first paragraph, a summary paragraph describing what was done by the SRWMD should be added. My understanding is as follows.<br>SJRWMD established three MFLs for most of its water bodies, and four or five for a few. SWFWMD developed only two MFLs. SRWMD also developed only two MFLs. Explain why SRWMD also developed only two MFLs. SRWMD should give its own reasoning for choosing only two MFLs. | End the first paragraph with the sentence: The following is a summary.<br>I am giving the following text for using in the next (new) paragraph, it may be modified as needed.<br>SJRWMD defines five MFLs: *Minimum Infrequent High (MIH), Minimum Frequent High (MFH), Minimum Average (MA), Minimum Frequent Low (MFL), and Minimum Infrequent Low (MIH)* flows and/or water levels. It established three MFLs for most of its water bodies (MFH, MA, and MFL), and four or five for a few (see Chapter 40C-8 F.A.C., January 31, 2016 for the names of the water bodies and the established values of MFLs). SWFWMD established two MFLs (give explanation for SWFWMD choosing only two MFLs). SRWMD established two MFLs (expand text giving explanation for choosing only two MFLs). Add what kind of support SRWMD derived from the SWFWMD methods. | |
| 29 | Page 12, 4.0 MFLs Methodology | No | SRWMD uses the methodologies developed by SJRWMD and SWFWMD. This approach is justified as commented earlier. | Additional explanation as suggested above is warranted. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 30 | Page 12, Section 4.1 Site Selection | No | This section describes transect sites selection, so revise the title. The four criteria used for selection comprehensively cover the necessary background for selection. | Revise the title as: TRANSECT SITES SELECTION | |
| 31 | Page 12, Section 4.1 Site Selection | No | Line 2 figure references need correction | Revise (Figure 4-1, T1-5) as: (Figure 4-1, T1-T5) | |
| 32 | Page 14, Section 4.2 Site Survey | No | The information collected as described under site survey should provide the necessary data for this project's completion. | Reviewer agrees with the survey methods | |
| 33 | Page 15, Section 4.3 Vegetation Sampling | No | This section describes vegetation sampling procedures done to collect data to set minimum frequent high (FH) and minimum frequent low (FL) by the SJRWMD methods. | Reviewer agrees with the vegetation sampling procedures | |
| 34 | Page 15, Section 4.4, third line | No | The phrase - precluding soil sampling – is awkward. | Revise it as: preventing soil sampling | |
| 35 | Page 15-16, Section 4.4 Soils Sampling | No | Describe how soil sampling is related to MFLs setting | Add text as appropriate | |
| 36 | Page 16, Section 4.5 Hydrologic Indicator Sampling | No | Reviewer agrees with Hydrologic Indicator Sampling procedure | No action necessary | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 37 | Page 16, Section 5.0 Data Analysis | No | The average elevation of the seasonally-flooded basin swamp was determined to represent the FH, while the average elevation of the landward extent of the semi-permanently-flooded deep marsh was determined to represent the FL. Explain why these two elevations represent FH and FL? Are these the guidelines from the SJRWMD methods? | Add text as appropriate | |
| 38 | Pages 16-17 Section 6.0 Consideration of Basin Alterations | No | Reviewer agree with the description and analysis given regarding the effects of basin alterations. | No change recommended | |
| 39 | Page 17, Section 7.0 MFLs Compliance Assessment | No | Procedures used for MFLs compliance assessment are acceptable and standard methods. A hydrologic model was calibrated for the period of 2005 – 2014 using the land use, water use, and ground water levels of the year 2006 because there were no significant changes in the basin since then, and long term simulated data were generated using the calibrated model, which is justified. | No change recommended | |
| 40 | Page 17, Section 7.0 MFLs Compliance Assessment | No | Para 2. Floridan aquifer was written as Florida aquifer at two places. | Correct it to Floridan aquifer | |

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| 41 | Page 18, Section 8.1 Vegetation, last paragraph | No | How did you conclude that there is no evidence of disturbance to the wetland community? | Add text to address question | |
| 42 | Page 19, Section 8.2 Determination of Basin Swamp Elevation | No | The average of these median elevations **were** (correct it to **was**) used in consideration of the variability between field personnel in setting benchmarks according to biological landmarks. | Change were to was | |
| 43 | Page 19, last paragraph | No | The average of these median elevations **were** used is incorrect grammar. | Revise it as: The average of these median elevations was used | |
| 44 | Page 20, Section 8.3 Deep Marsh Elevation | No | The paragraph describing deep marsh elevation is too concise. Expand giving a reference to a table or figure regarding the outliers, also discuss on the nature of the outlier soundings. | Add text to address this issue. | |
| 45 | Page 20, Section 8.3 Deep Marsh Elevation | No | The statement: Although sample size was limited due to occurrence of the target species; results from this sampling event still provided a tight range in elevation of stands, where a 95% confidence interval represented a spread of 0.4 feet. | This statement is not clear. Expand and give greater description | |
| 46 | Page 20, Section 8.4 Soils | No | This is more in Dr. Dunn's expertise, please refer to his comments. | No change recommended | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 47 | Pages 20-21, Section 8.5 Hydrologic Indicators | No | Hydrologic Indicators section briefly discusses the principles of setting up MFLs. Please explain the *Cypress Standard* for the benefit of the readers. Figure 8-1 is an excellent illustration to show where the SJRWMD and SWFWMD based MFLS for Lake Butler lie on the stage-duration curve.<br>In the last full paragraph, Figure 8-1 is written as Figure 8, which should be corrected.<br>The title of Figure 8-1 (Page 21) states, '---using interpolated daily stage data for the POR January 1983 to December 2014.' Using this daily interpolated historic stage data,<br>1) Draw a daily stage hydrograph for POR to illustrate the historic stage variation.<br>Develop MFLs frequency graphs similar to Figures 5-7 and 5-8 of ECT (2016). Refer to Rao (2005 Draft). | Add the clarifications requested | |
| 48 | Pages 21 to 23, Section 9.0 Conclusions and Recommendations | No | Based on the information and discussions presented reviewer agrees that MFLs have been developed using best available data sources and analytical methods. | No change recommended | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 49 | Page 21, Section 9.0 Conclusions and Recommendations | No | This section summarizes the work performed by SRWMD in setting up and verifying Lake Butler MFLs: MFLs setting methods, data collection, modeling, and other analyses. I agree with these steps in MFLs setting. However, the reviewer raised some critical questions about the compliance analysis, which need response and resolution. | Provide a response. | |
| 50 | Page 22 Table 9-1 | No | The two recommended hydrologic events (magnitude, duration, return interval) as the MFLs are based on the methods and concepts of the SJRWMD. Reviewer agrees with Table 9-1 | No change recommended | |
| 51 | Page 22 last paragraph | Yes | Use of the year 2006 as baseline condition is justified because there were no significant changes in the basin since then. However, as this reviewer concluded that the established minimum frequent low (FL) is not met based on the simulated data, the result that MFLs would be violated at a Floridan aquifer drawdown of 5.0 ft is not valid. | Perform additional analyses as suggested earlier and add appropriate text | |
| 52 | Page 24, References | No | References from Appendixes also are included in the list of references. | Move References section and place it after Appendix E | |
| 53 | Page 24, References | No | Reference Adamus et al., last line: Palatka, Fla.: **Suwannee** River Water Management District is incorrect. | Revise it to: Palatka, Fla.: St. Johns River Water Management District. | |
| 54 | Page 24, References | No | Reference Adamus et al. It appears this work is not referenced in the present report. | Verify and delete if not referenced | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 55 | Page 24, References | No | Reference Epting, R.J. 2007, last line: John's Water Management District is incorrect | Revise it as: St. Johns River Water Management District | |
| 56 | Page 25 | No | Reference Kinser, P.D., last line: **Suwannee** River Water Management District, Palatka, FL. is incorrect | Revise it to: St. Johns River Water Management District, Palatka, FL | |
| 57 | Page 26 | No | Reference: [SJRWMD] **Suwannee** River Water Management District. 2006. Minimum Flows and Levels Methods Manual. **Suwannee** River Water Management District, Palatka, Fla.is incorrect | Revise it as: [SJRWMD] St. Johns River Water Management District. 2006 Draft. Minimum Flows and Levels Methods Manual. St. Johns River Water Management District, Palatka, Fla. | |
| 58 | Page 26 | No | The publication 'SWRF, ICPR model' was referenced on Page 29, but not included in the list of references. | Include it in the list of references | |
| 59 | Page 29, last paragraph | No | The SWRF, ICPR model | Expand SWRF, ICPR with the publication year and include it in the list of references. | |
| 60 | Page 31, Last Paragraph | No | Fifth line from the bottom: FEMA is not previously called out | Use full title and include FEMA in parentheses if it is going to be used again | |
| 61 | Page 31, Last Paragraph | No | North American Datum of 1983 (HARN)<br>What is HARN? Please spell out the acronym. | Expand the acronym HARN. Include it in the list of references if it is a publication, or source of data and information. | |
| 62 | Page 32, First Paragraph | No | ESRI ArcMap 10.0 software (ESRI 2011) – ESRI is not previously called out | Expand ESRI to its complete name and call it out in parenthesis if it is going to be used again | |
| 63 | Page 32, Last Paragraph | No | Florida Land Boundary Information System (LABINS 2010) – Not found in references | Include it in the list of references | |
| 64 | Page 40 | No | Incomplete tabular summary at top of page. Does it belong? | Revise as appropriate | |

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| 65 | Page 40, Table C3 | No | Typo in line for Pond cypress—change the comma to a right paren. | Revise as indicated | |
| 66 | Page 46 | No | Removing outliers | Add a description on the outlier points | |
| 67 | Page 47 Figure C3 | No | A little better explanation of the statistical analysis, and the use of this table are needed. | Revise as appropriate | |
| 68 | Page 48, second line | No | USDA- NRCS soil survey **(Figure) –** not clear which figure is referred to | Revise as appropriate | |
| | | | **Lake Butler Water Budget Modeling—Phase B** | | |
| 69 | Page 1-1 Executive Summary | No | SRWMD and ECT selected EPA's Storm Water Management Model (SWMM) to assess long-term hydrologic changes at Lake Butler. The model emphasis is on storm water and water quality assessment, but it is essentially a general hydrology model and is capable of meeting the present needs. Other well-known models such as, HSPF and SWAT, also serve the same purpose, therefore, I agree with selection of SWMM for the present modeling work. | No change recommended | |
| 70 | Page 1-1 | No | Explain why ECT chose to call the present model as a water budget model instead of a hydrologic simulation model. | Add explanatory text as appropriate | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 71 | Page 1-2 Model calibration | No | ECT calibrated the model for the period 2005-2014 for the 2006 hydrologic conditions, which did not show major variation through 2014. It performed long-term simulation for the period 1983-2014 using the calibrated model because model input data (e.g., rainfall) were available for this period. Use of similar procedures is common in hydrologic model studies, and I agree with these methods. | No change recommended | |
| 72 | Page 1-2 Model calibration, Para 2 | No | The primary **criteria** for acceptable model calibration is 0.5 foot or less root mean square error is incorrect use of **criteria**. | Correct it to: criterion | |
| 73 | Page 1-2, Task 3. Long-term model simulation. Para 1, last sentence | No | The sentence - The historical groundwater well records were evaluated through a double-mass curve analysis to determine whether significant historical drawdowns might be detected - should be clarified. | Revise it as: The historical groundwater well records were evaluated through a double-mass curve analysis **to study historical ground water level fluctuations.** | |
| 74 | Page 1-2, Task 3. Long-term model simulation | Yes | The statement - Both the recommended minimum frequent high and minimum frequent low levels are being met under 2006 hydrologic conditions.<br>This reviewer finds that the recommended minimum frequent low level is not met (see comments under the main report). | Perform additional analyses as suggested in the main report review. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
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| 75 | Page 1-3, first paragraph, first sentence | No | The sentence: The water budget model was also used to assess the hydrologic effects of the Upper FAS **drawdowns** in the context of the recommended MFLs.<br>Drawdowns may not be the correct word in the present scenarios context. Here, simulations were performed assuming the Floridan Aquifer potentiometric elevation (FAPE) to be lower than the 2006 FAPE. Simulations were continued gradually lowering the FAPE value until the recommended MFLs were tripped (i.e., no longer complied). When you pump water from a well, a cone of depression forms in the aquifer along the center of the well. You may call it a drawdown, but it is local, not across the board (i.e., the fall in water table will not occur over the entire aquifer). In the case of surface water reservoirs, on the other hand, when you release water through sluice gates or over spillways, the fall in the reservoir level is across the board and instantaneous (There is a hydrodynamic explanation for this occurrence). A true drawdown in the case of an aquifer is not achievable like in a surface water reservoir. Please revise the text as suggested in the next column. | Revise the text as: The water budget model was also used to determine the limit of the Upper FAS elevation at which the recommended MFLs will no longer be complied. For this, simulations were performed assuming the Floridan Aquifer potentiometric elevation (FAPE) to be lower than the 2006 FAPE. Simulations were continued gradually lowering the FAPE value until the recommended MFLs were tripped (i.e., exceeded). | |

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| 76 | Page 1-3, first paragraph | Yes | Effects of the Upper FAS drawdowns in the context of the recommended MFLs.<br>The result produced, 'the recommended MFLs would be met with a maximum drawdown of 5.0 ft beyond 2006 hydrologic conditions,' cannot be considered as valid because one of the MFLs is not met. | Perform this analysis after establishing that both of the established MFLs are met. | |
| 77 | Page 2-1, General description | No | The Lake occupies approximately 460 acres is an awkward statement. | Rewrite it as: The Lake has an area of approximately 460 acres | |
| 78 | Page 2-1 Section 2.2 Climate,<br>Paragraph 2 | No | Mean annual rainfall is given as 54.2 inches. Which stations, what is the period?<br>Mention which rainfall stations are closer to Lake Butler. Instead of stating, 'These rains can be heavy and of long duration. As much as several inches of rain can fall in a 24-hour period,' give examples of recorded values for the closest rainfall station. | Make appropriate revisions to text. | |

| | | | | | |
|---|---|---|---|---|---|
| 79 | Page 2-1<br>Section 2.2<br>Climate | No | Atlantic Multidecadal Oscillation (AMO) is regarded as indicative of the cyclical patterns of south and central Florida rainfall. AMO has warm and cool phases, the warm phase indicating generally higher rainfall and the cool phase lower rainfall (Enfield et al. 2001). Figure AMO2011 (Figure 3 of this report) shows the historic phases of AMO. As per this figure, your entire long term simulation period (1983-2014) falls in a warm phase, indicating thereby it is generally a wet phase. Please calculate the mean annual rainfall values for 1983-2014 for the nearby stations (Gainesville, Starke, and Lake City) and for the period 1951-1982, and compare the two values. If the rainfall patterns followed AMO, 1951-1982 would be relatively a dry phase.<br>At SJRWMD, this reviewer completed a comprehensive report on AMO and found that there is a strong qualitative resemblance between AMO and the rainfall and streamflow patterns of Northeast Florida (Rao 2008 Draft).<br>Kelly and Gore (2008) of SWFWMD studied the effects of AMO on the peninsular Florida river flows and rainfall in the context of MFLs. They emphasize the importance of selecting 'an appropriate baseline flow period' (for MFLs analysis) and suggest 'it may be appropriate to have at least two baseline periods; one based on a 'wet' period and one based on a 'dry' period. They also state, 'These results have important implications not only for the establishment of ecological flows, but also for water supply planning and development, flood control and stream ecology in general, since there are considerable differences in the magnitude of flows that should naturally be expected between multidecadal periods. Relatively large decreases and increases in flow are attributable to rainfall differences between multidecadal periods. | Revise text as appropriate | |

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| | | | As per this figure, the entire long term simulation period (1983-2014) chosen for this study falls in a warm phase, indicating thereby it is generally a wet period. | | |
| 80 | Page 2-2 Section 2.3 Topography | No | In addition to Figure 2-2, a regular contour map would be useful | Suggest adding a regular contour map or one developed using Figure 2.2 | |
| 81 | Page 2-2 Section 2.4. Soils | No | This section describes soils in the study area by Hydrologic Soil Groups (HSG). A description of how the HSG information was used in modeling would be helpful. | Add description of how the HSG information was used in modeling? | |
| 82 | Page 2-4 Section 2.6 Major Conveyance Systems | No | Last Paragraph: Were the un-surveyed culverts addressed in the modeling? In what way? | Add explanation as necessary | |
| 83 | Page 3-1 Section 3.11 Model Selection | No | SWMM model selection: SWMM is one of the most widely used hydrologic models in the nation, and we support its selection. | No changes recommended | |
| 84 | Pages 3-2 to 3-8 Section 3.2 Hydrologic Modeling | No | ECT mentions that it extracted much of the modeling information from SWMM user's manual. But some description should be given about the sources of tables 3-1, 3-2, and 3-3. | Add text as appropriate | |
| 85 | Page 3-2, Subbasin delineation | No | Describe the convention used in designating the subbasins, B, AB, NB etc. | Add text as appropriate | |

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| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 86 | Page 3-3, Paragraph 2 | No | Table 3-1 look up table. Is there a reference to this table? | Add reference as appropriate | |
| 87 | Page 3-3, last two lines | No | (ORNL) (1/1/1880 to 12/31/2014) - I checked ORNL data availability, I think it is from 1/1/1980 not 1/1/1880 | Revise as appropriate | |
| 88 | Page 3-5, last paragraph | No | (ET) can occur **for** standing water needs revision | Revise: (ET) can occur **from** standing water | |
| 89 | Page 3-5, last paragraph | No | Water **travelling** through includes a misspelling | Revise travelling to **travelin**g | |
| 90 | Page 3-6 | No | Please prepare a table of monthly ET values as used in the final long-term simulation. | Prepare and add a table of monthly ET values as used in the final long-term simulation | |
| 91 | Page 3-6, the sentence above Table 3-2 | No | Lake Butler was excluded -------. | This sentence is not clear, explain. | |
| 92 | Page 3-7 | No | Showing the Green-Ampt equation would be helpful | Add equation | |
| 93 | Pages 3-8 to 3-12 Section 3.3 Hydraulic Modeling | May be | Sections 3.3.1 through 3.3.9 describe hydraulic modeling features, which are quite standard procedures. But, LiDAR-based DEM data are exclusively used throughout. Is this data cross-checked, for example in deriving depth-area relationships, which are quite critical for modeling? | Address question | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 94 | Pages 3-12 to 3-15 Section 3.4 Preliminary Model Development & Simulation | No | Section3.4 describes parameterization of hydrologic and hydraulic model parameters and preliminary model simulation for two years. Describe the results of the preliminary model simulation. | Add description as necessary | |
| 95 | Page 3-13, third paragraph | No | Word **frictional** occurs at two places, but is incorrect | Correct it to: fictional | |
| 96 | Page 3-13, Section 3.4.2 and 3.4.3 | No | The nomenclature used in Figures 3-3 and 3-4 needs explanation | Add explanation of nomenclature | |
| 97 | Page 4-1, Section 4.1 Model Calibration Period | No | This simulation span includes a variety of hydrologic conditions, including a significant high (2014) and two significant low periods (2006-2008 and 2011-2012).<br>In what respect are these periods 'significant high (2014)' and 'significant low periods (2006-2008 and 2011-2012)?' | Add text as appropriate | |
| 98 | Page 4-1, second paragraph | No | Reviewer recommends using **withdrawals of water** rather **than consumptive water withdrawals**, or **consumptive use.**<br>Change **appears** to **appear**. | Make corrections as requested | |
| 99 | Page 4-2, first paragraph | No | (SJRWMD, 2014) | Revise it as: (Robison, 2014) | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 100 | Pages 4 -2 to 4-13 Section 4.3 Model Calibration Approach | No | In these pages the modelers make several adjustments to model parameters and in modeling assumptions. These are common approaches in modeling, but I have specific questions/suggestions on some of them and the modelers should respond. | | |

| | | | | | |
|---|---|---|---|---|---|
| 101 | Page 4-3, continuation of Section 4.3.1.2, **Evapotranspiration** | Maybe | Description of area-weighted daily PET data is not clear. Please answer the following.<br>(1) Figure 4-1 gives the Rainfall/ET pixels. There are eight pixels covering the basin. Pixel 152948 is primarily Lake Butler. For a typical month/year by what amount other pixels' PET differed from Lake Butler? Is Figure 4-2 the area - weighted daily PET for the entire Lake Butler basin? Are these values computed by ECT (Please give an example of calculation just for a day)? Based on this data, please prepare a monthly PET table. Are these values used for all the sub-basins without any correction?<br>(2) Paragraph 3 states, 'The average annual PET value was estimated at 47.6 inches per year for the Lake, based on the area-weighted daily PET data of 1996 through 2014. What about other sub-basins, is it not the same? Why would Lake Butler be different?<br>As per the opening sentence of this section (Page 4-2), the PET data you get from the USGS for each pixel represents various land cover types of Florida, that means it is applicable to just that pixel. The area-weighted daily PET for the Lake Butler basin that you calculate is a mix of all land uses of the basin and cannot be used (uniquely) in any way in the present modeling. Please clarify how you used this data.<br>The point the reviewer would like to bring out is, you have ET coefficients (Table 3-2) to take care of the ET based on land use, all that you need is daily ET values for the basin (you have to find a nearby long term ET station), which will be one time series and it can be taken by SWMM. | Address comments, provide answers, and adjust text as appropriate | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 102 | Page 4-3 | No | The average annual PET value was estimated at 47.6 inches **per year. The use of per year is incorrect.** | Correct it as: The average annual PET value was estimated at 47.6 inches. | |
| 103 | Page 4-3 | No | average annual evaporation for shallow lakes in the SJRWMD vary from 45 to 48 inches **per year. The use of per year is incorrect.** | Correct it as: average annual evaporation for shallow lakes in the SJRWMD vary from 45 to 48 inches. | |
| 114 | Page 4-4, Lake stages | No | It is stated observed (aperiodic) stage data are available from 1957. A stage hydrograph of the available data should be drawn and included. | Draw hydrograph and include it in the document. | |
| 105 | Pages 4-4 and 4-5, Impervious percentages | Maybe | Reducing impervious area uniformly for all years may give biased results for some years (e.g., may increase infiltration). Do you have a provision in the model to vary it by years? For example, you may use lower impervious area during low rainfall years, and keep higher during other years. | Address question and revise text as necessary. | |
| 106 | Page 4-5, Table 4-1 | No | What is the source of this data? | Add description/reference of source. | |
| 107 | Page 4-12, Paragraph above Section 4.3.3.3 | No | The final coefficient A was set at 0.013, by applying a factor 130 to the initial value. Please explain. | Explain and adjust text as necessary. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 108 | Pages 4-13 to 4-15 Section 4.4 Model Calibration Results | May be | Model calibration results summarized show that the calibration goals are met. However, I have previously expressed my concern over the use of area-weighted daily PET data, whether it was accurately and successfully applied. I have additional concerns on the Water Budget Results as described next. | Address concern and revise document as necessary. | |
| 109 | Page 4-14, Water Budget Results | May be | Various components of the water budget included in the categories of Runoff Quantity, Groundwater and Flow Routing are well listed. However, to give the reader a feel for what they are in terms of magnitude, please prepare a water budget table summarizing the average values of the calibration period. The summary table should include sub-basins (Column 1, Table 4-2 and aquifers Column 1, Table 4-3).<br>For the 10-year calibration simulation, the last paragraph summarizes the values of some of the water budget components (e.g., precipitation, ET, deep percolation, etc.). The water budget results also are shown on Figure 4-10, but a number of values in the figure are rather puzzling. Why is the ET from water/lakes a low of 8.3 in/yr. and infiltration from land area a high of 36.6 in/yr.? On Page 4-3, quoting Robison (2014) average evaporation for shallow water bodies in the SJRWMD varies from 45 to 48 inches. ECT states, 'average evaporation for shallow lakes in the SJRWMD varies from 45 to 48 inches; it should be about the same for SRWMD lakes as well. | Address questions/concerns and revise document as necessary. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| | | | A water budget table I suggested should provide the answers. | | |
| 110 | Page 4-15 | No | Page number is incorrect. | Correct Page 4-2 as 4-15 | |
| 111 | Page 4-15, Summary of model calibration | May be | Statement: Lake Butler water budget model has been successfully calibrated.<br>I have to see the information I requested to concur with this statement. | Provide information to reviewer and consider his future comments based on that data | |
| 112 | Page 5-1 Section 5.1 Introduction, second paragraph | No | Is availability of groundwater data for 1/1/1983 – 12/31/2014 the reason for choosing this period for long-term simulation? | Address question and revise text as necessary | |
| 113 | Page 5-2 Table 5-1 | No | ORNL = Oak Ridge National Laboratory, include it in the table or text.<br>Because long-term rainfall and ET data are from two sources run a double mass analysis and verify whether they are compatible. | Revise text as appropriate and run double mass curve as suggested. | |
| 114 | Page 5-3, Paragraph 1 | No | PET data is not synthesized, it is estimated from NOAA data. | Adjust text as necessary | |
| 115 | Page 5-4 Section 5.3 Draft Recommended MFLs | No | Section 5.3 Draft Recommended MFLs describes the MFLS for Lake Butler recommended by the SRWMD, and the event definitions provided by SJRWMD. I agree with the information given. | No changes recommended | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 116 | Page 5-4 and 5-5 Section 5.4 Long-term Simulations and MFLs | Yes | I raised some concerns on the use of the area-weighted PET and the results of the 10-year calibration simulation. If these issues are not satisfactorily resolved, modeling may have to be re-done using some agreed upon procedures.<br>This reviewer has also shown that FL is not being met. | Address these concerns with reviewer | |
| 117 | Page 6-1 Section 6.1 Introduction | No | The two assumptions described in the introduction to assess hypothetical water resource development may be regarded as valid. | No changes recommended | |
| 118 | Pages 6-1 and 6-2 Section 6.2 Assessment of Hypothetical Allowable Floridan Aquifer Drawdowns | Yes | The method of analysis used in the Assessment of Hypothetical Allowable Floridan Aquifer Drawdowns may be regarded as valid and acceptable. However, since this reviewer has shown that one of the MFLs, the FL, is not being met, the result drawn cannot be considered as valid. | Address this concern with reviewer. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | A. Reviewer's Specific Comments | B. Reviewer's Specific Recommended Corrective Action (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | C. Action to be Taken in Response to Comment |
| 119 | Pages 7-1 to 7-3 Section 7.0 Conclusions and Limitations | Yes | This section summarizes the procedures used in modeling and the results produced.<br>Page 7-1, Paragraph 3, Whether the model was well calibrated will be determined after the additional information that I requested are produced.<br>Page 7-1, Paragraph 4: One of the MFLs is not being met.<br>Page 7-1, Paragraph 5. The result produced under hypothetical FAS drawdowns may not be considered valid because one of the MFLs is not being met. | Address comments with reviewer | |
| 120 | Pages 7-2 and 7-3 Section 7.0 | No | The six principal modeling assumptions made in developing the water budget model may be regarded as applicable and valid. | No recommended changes | |
| 121 | Page 8-1, last reference | No | Second line from bottom: Johns River Water Management District.<br>Correct it as: St. Johns River Water Management District. | Please make this correction. | |

| Comment No. | Figure, Table, or Page and Paragraph Number | Does Comment Directly and Materially Affect Conclusions of Report? (Yes/No) | To be completed by Reviewer(s) Table 1-2, Rao | | To be completed by Report Author(s) |
|---|---|---|---|---|---|
| | | | **A. Reviewer's Specific Comments** | **B. Reviewer's Specific Recommended Corrective Action** (Comments in red are in response to District's responses in column C (Action to be Taken in Response to Comment) of this table) | **C. Action to be Taken in Response to Comment** |
| 122 | Figures 5-7, 5-8, 6-1 and 6-2 | May be | Use of a statistical fit is not recommended for low flow frequency analysis unless it is a close fit of data (Riggs 1972). For MFLs compliance analysis, as per SJRWMD methods,' if any pertinent event lies within the shaded box the minimum level is being met.' Otherwise, a best-fit line is drawn **by inspection** (Robison 2014). See also Figure 5 in Riggs (1972) as an example. Therefore, do not add a Pearson Type III fit in these graphs. You can draw your conclusions by the positions of the pertinent events or drawing a best fit line by visual inspection if the events do not fall in the shaded box. This reviewer drew a best-fit line by inspection for data in Figure 5-8. | Address reviewer's concerns | |

# Appendix C
# Table 2-1. Dunn Replies to SRWMD's Peer Review Assessment Requirements

# TABLE 2-1. DUNN REPLIES TO SRWMD'S PEER REVIEW ASSESSMENT REQUIREMENTS

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments Table 2-1, Dunn |
|---|---|---|---|
| A. Determine whether the conclusions in the Lake Butler MFLs report are supported by the analyses presented | 1. Supporting Data and Information: review the relevant data and information that supports the conclusion in the report to determine: | a. Data and information used was properly collected. | Reviewer concurs that the data and information used in the District's MFLs report and the ECT report was properly collected. This includes data and information collected for vegetation, soils, topography and ground surface elevation, lake surface level time series, wetland hydrologic indicator elevations, precipitation, and evapotranspiration. |
| | | b. Reasonable quality assurance assessments were performed on the data and information. | A complete, integrated picture of quality assurance (QA) is not provided in either the District's MFLs or ECT reports. There is, however, a good deal of QA provided in both reports. In regard to statistical analyses, the results are stated in reports, but the summary statistical support is often not given. As such, the reviewer cannot confirm or verify the result presented. I suggest that an integrated summary of important QA elements could be addressed in an analysis of uncertainty. The uncertainty analysis should include recommendations for how the District can improve its management and protection of Lake Butler ecosystem. |
| | | c. Exclusion of available data was justified. | Reviewer notes in Appendix A, Table 1-1, that the outlier analysis cannot be verified, because the supporting statistical analysis is not fully presented. |
| | | d. The data used was the best information available. | Yes, reviewer found this to be true; recognizing that often tradeoffs have to made in selecting the best available source of data depending on the analytical method, tool, or model used. |
| | 2. Technical assumptions: review the technical assumptions inherent to the analysis used in the report to determine whether: | a. The assumptions are clearly stated, reasonable and consistent with the best available information | Yes, reviewer found this to be true. |
| | | b. The assumptions were eliminated to the extent possible, based on the available information. | Yes, the two reports and supporting material in the respective appendices had many assumptions which I generally found to be clear and reasonable. In the few cases where assumptions and/or logic were not clear, I posed questions to staff (see Table 1-1 Appendix A). |

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-1, Dunn |
|---|---|---|---|
| | | c. Other analyses that would require fewer assumptions but provide comparable or better results are available. | I found that the analyses used and presented were good choices. I did not identify any analyses for which I would recommend a different method. |
| | 3. Procedures and analyses: review the procedures and analyses used in the report to determine whether: | a. The procedures and analyses were appropriate and reasonable based on the best information available. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | b. The procedures and analyses incorporate all necessary factors. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | c. The procedures and analyses were correctly applied. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | d. Limitations and imprecisions in the information were reasonably handled. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | e. The procedures and analyses are repeatable. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | f. Conclusions based on the procedures and analyses are supported by the data. | Yes, reviewer found this to be true. The reviewer and Dr. Rao do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-1, Dunn |
|---|---|---|---|
| B. If a proposed method used in the report is not scientifically reasonable, then please provide: | 1. List and describe scientific deficiencies and, if possible, evaluate the error associated with the deficiencies. | | In Table 1-1 in Appendix A reviewer notes several specific remedies to manage uncertainty. |
| | 2. Determine if the identified deficiencies can be remedied. | | Yes, an integrated management plan for handling key sources of uncertainty should be developed. Specific recommendations as to how to do this using adaptive management approach are provided in my summary comments in Discussion section of this report, and in specific comments in Appendix A, Table 1-1. |
| | 3. If the identified deficiencies can be remedied, then please describe the necessary remedies and an estimate of the time and effort required to develop and implement each remedy. | | I did not identify any major deficiencies. I do, however, make several recommended improvements to the reports. These are given in the Summary section of this report, and in Appendix A, Table 1-1. |
| | 4. If the identified deficiencies cannot be remedied, then if possible, identify one of more alternative methods that are scientifically reasonable | | It is expected that sources of uncertainty can be controlled to the extent that the District uses the best available information and best available analytical tools to develop MFLs. Specific recommendations as to how do this using and adaptive management approach are provided in my summary comments in the Discussion section of this report. |

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-1, Dunn |
|---|---|---|---|
| C. If a given method or analysis in the report is scientifically reasonable, but an alternative method(s) is preferable, then: | 1. List and describe the alternative reasonable scientific method(s) and include a qualitative assessment of the effort required to collect data necessary for implementation of the alternative method(s). | | For each of the principle components of uncertainty an approach to reduce the effect of uncertainty will be helpful for this stage of setting MFLs and for future compliance assessments. |

# Appendix D
# Table 2-2. RAO Replies to SRWMD's Peer Review Assessment Requirements

# TABLE 2-2. RAO REPLIES TO SRWMD'S PEER REVIEW ASSESSMENT REQUIREMENTS

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-2, Rao |
|---|---|---|---|
| A. Determine whether the conclusions in the Lake Butler MFLs report are supported by the analyses presented | 1. Supporting Data and Information: review the relevant data and information that supports the conclusion in the report to determine: | a. Data and information used was properly collected. | Reviewer agrees that the data and information used in the District's MFLs report and the ECT report was properly collected. This includes data and information collected for vegetation, soils, topography and ground surface elevation, lake surface level time series, wetland hydrologic indicator elevations, precipitation, and evapotranspiration |
| | | b. Reasonable quality assurance assessments were performed on the data and information. | Not much information is included in either report with regard to quality assurance methods used. Therefore, this reviewer cannot comment on this issue. |
| | | c. Exclusion of available data was justified. | Reviewer notes in Appendix A, Table 1-1, that the outlier analysis cannot be verified, because the supporting statistical analysis is not fully presented. |
| | | d. The data used was the best information available. | Yes, reviewer agrees with it; recognizing that often tradeoffs have to be made in selecting the best available source of data depending on the analytical method, tool, or model used. |
| | 2. Technical assumptions: review the technical assumptions inherent to the analysis used in the report to determine whether: | a. The assumptions are clearly stated, reasonable and consistent with the best available information | Yes, reviewer found this to be true. |
| | | b. The assumptions were eliminated to the extent possible, based on the available information. | Yes, the two reports and supporting material in the respective appendices had many assumptions which I generally found to be clear and reasonable. In the few cases where assumptions and/or logic were not clear, I requested for clarification or additional results. |
| | | c. Other analyses that would require fewer assumptions but provide comparable or better results are available. | I found that the analyses used and presented were good choices. I do not identify alternatives. |

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-2, Rao |
|---|---|---|---|
| | 3. Procedures and analyses: review the procedures and analyses used in the report to determine whether: | a. The procedures and analyses were appropriate and reasonable based on the best information available. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | b. The procedures and analyses incorporate all necessary factors. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | c. The procedures and analyses were correctly applied. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | d. Limitations and imprecisions in the information were reasonably handled. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | e. The procedures and analyses are repeatable. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| | | f. Conclusions based on the procedures and analyses are supported by the data. | Yes, reviewer found this to be true. The reviewer and Dr. Dunn do, however, make recommendations for improving the strength of the underlying technical support of the recommended levels. This is especially true regarding the management of the primary sources of uncertainty. |
| B. If a proposed method used in the report is not scientifically reasonable, then please provide: | 1. List and describe scientific deficiencies and, if possible, evaluate the error associated with the deficiencies. | | This reviewer found some puzzling results in ECT Figure 4-10, Water Budgets of SWMM Simulation (2005-2014). To resolve the issue this reviewer requested detailed presentation of results. |

| Task | Subtask | Sub-subtask | Reviewer's Specific Comments<br>Table 2-2, Rao |
|---|---|---|---|
| | 2. Determine if the identified deficiencies can be remedied. | | The deficiencies can be remedied either by properly documenting the results or repeating the modeling steps if any deficiencies are discovered in model input data or other modeling methods. |
| | 3. If the identified deficiencies can be remedied, then please describe the necessary remedies and an estimate of the time and effort required to develop and implement each remedy. | | ECT will have to make the required estimates. |
| | 4. If the identified deficiencies cannot be remedied, then if possible, identify one of more alternative methods that are scientifically reasonable | | There is no specific alternative to rectify the identified deficiencies, the present methods are not deficient; only the calculations (i.e., the modeling process) should be repeated. |
| C. If a given method or analysis in the report is scientifically reasonable, but an alternative method(s) is preferable, then: | 1. List and describe the alternative reasonable scientific method(s) and include a qualitative assessment of the effort required to collect data necessary for implementation of the alternative method(s). | | This reviewer does not see any concrete alternatives to the methods used in the present MFLs effort. |