

Peer Review Panel's Chair's Evaluation of Public Comments Submitted: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

PREPARED FOR



Suwannee River Water Management District

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INTRODUCTION

OVERVIEW

The Suwannee River Water Management District (District) has included an MFLS re-evaluation for Lower Santa Fe and Ichetucknee Rivers and their associated priority springs in 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, the District has identified these MFLs for independent scientific peer review.

The re-evaluation of these MFLs has been completed. These recommended MFLs are described in a document titled ***Minimum Flows and Minimum Levels Re-evaluation for Lower Santa Fe and Ichetucknee Rivers and Priority Springs Draft Report December 2019***, prepared for the District by HSW Engineering, Inc. (HSW).

This document is prepared under Task Work Assignment (TWA) 19/20-030.002. The TWA authorizes Dr. Bill Dunn, the Peer Review Chair to complete the following:

- a. The Peer Review Chair will review Public Comments delivered to the District by March 13, 2020. The District will provide the Peer Review Chair with all Public Comments received.
- b. The Peer Review Chair will deliver a memorandum acknowledging the of the public comments and include any comments he may have on them

BACKGROUND

Subsection 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 (Subsection 373.0421, F.S.). The State Water Resource Implementation Rule (Chapter 62-40, Florida Administrative Code) includes additional guidance for the establishment of MFLs.

Subsection 373.042, F.S., also addresses the conduct of 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.

The technical peer review of the proposed MFLs is already underway. Three experts comprise the Peer Review Panel (PRP). The three independent technical peer reviews (Dunn 2020a, Munson 2020, and Motz 2020) with their respective fields of expertise are:

- Dr. Louis Motz, P.E.—Water resources engineering, groundwater modelling
- Dr. Adam Munson, P.E.—MFLs development, statistical methods, riverine ecology
- Dr. William Dunn—MFLs development, systems ecology, wetland & aquatic ecology, analysis of uncertainty, and adaptive management

The Peer Review Panel 's Chair's Consensus Report (Dunn 2020b) provides a summary of individual and collective findings and recommendations based on the substantive comments made by each of the three PRP members. The summary from the Chair's report is included as Attachment A. Table 1 in Dunn 2020b (Attachment A) provides a statistical summary of panel members comments, broken down by individual sections of HSW's MFLs report, including its six appendices. Summary also includes a yes or no flag as to whether the issue is a substantive one, that is one that can directly and materially affect conclusions of report.

FOCUS ON SUBSTANTIVE REVIEW COMMENTS

For this document substantive comments are defined as those that each reviewer identified as having the potential to directly and materially affect the conclusions of the MFLs report (HSW 2019). Each substantive comment is thus an issue of concern, a problem, a question, a need for additional information, or a recommendation for an alternative. These are the sources of uncertainty in eyes of each reviewer. Individually and collectively they are the active part of the peer review. A statistical summary quickly shows patterns.

RESULTS

District provided the me the Peer Review Chair with Public Comments delivered to the District by March 13, 2020. Eight submittals were received. Two were simple letters, while six contained sets of comments. The two letters gave non-specific or overly broad recommendations.

Importantly, the District's and FDEP's instructions for conducting technical peer review of MFLs requires that each reviewer identify substantive comments which the District defines as those that have the possibility of causing a change to the report's conclusions including its recommended MFLs. To this end my review focused on identifying substantive comments, those that could have a significant effect on the MFL setting process, assessment of significant harm, and the outcomes of applying the proposed MFLs as protective constraints in water management. This is same procedure used to compile the Chair's summary report (Dunn 2020b) for the Peer Review Panel (PRP).

Results of my review found fifty-one (51) substantive comments collectively across six sets of reviews. These break out as follows:

- Alachua County EPD--four
- Sam Upchurch—twenty-three
- Liquid Solutions Group--five
- Florida Springs Institute (FSI)—seven
- Ichetucknee Alliance--nine
- Florida Springs Council--three

The inventory of substantive comments by each of six submittals follows.

ALACHUA COUNTY ENVIRONMENTAL PROTECTION DEPARTMENT (EPD)

A two-part review comment set was submitted on February 5, 2020 by Mr. Chris Bird the Director of Alachua County Environmental Protection Department (ACEPD 2020). The submittal included a two-page letter report from Mr. Bird, and a 16-page formal technical peer review by Sam Upchurch P.G., Ph.D. The peer review by Dr. Upchurch is covered separately in the following subsection.

AC 1--page 1

County staff echo the Geologist's concerns outlined in the peer review report and would like to reiterate the limitations of the water use data which is at the core of the draft MFL. Appendix B (Water Use Hindcasting) outlines the water use data but neglects to compensate for known insufficiencies in existing water use datasets. For example, landscape irrigation wells are not included in the water use data. Highlighting the existing knowledge gap, the USGS recognized in their 2014 report, "Water Withdrawals, Use and Trends in Florida, 2010" that a possible factor in the decreasing public supply per capita use could be a shift by commercial and residential public supply customers to other water sources such as irrigation wells that are not accounted for in water use datasets. In addition to the lack of clear data on irrigation wells, domestic self-- supply water use is currently estimated which inherently leaves uncertainty in the use data particularly in rural areas where domestic self-supply is a primary source. The USGS has been seeking funding to verify and improve this important data set for rural areas such as the Santa Fe River Basin.

AC 2—page 1

Overwhelming scientific evidence makes it clear that climate change is a critical driving factor that must be included in modeling and planning efforts. While there is a growing body of exhaustive climate change data and research, there continues to be a high degree of uncertainty with the datasets and methodologies in making assessments at the regional, basin-level, and local scales. This glaring lack in climate modeling and planning at these localized scales makes it imperative to err on the side of caution and to apply the Precautionary Principle when setting the MFLs.

AC 3—page 2

Finally, County staff question the assumption that a 15% harm or reduction to the Water Resource Values is an acceptable threshold for adequately protecting the resources.

County staff request a rigorous analysis and critique of this paradigm and the baseline from which it is calculated.

County staff are concerned that the methods used indicate that more water is available while, insufficiencies in datasets and methodologies have created margins of error that may be greater than actual available water.

AC 4—page 2

There has been no mention of a Recovery Plan that outlines measures to decrease groundwater pumping via regulatory and educational methods. The 2014 Recovery Strategy for the Lower Santa Fe River Basin should be strengthened and updated as part of the MFL process.

SAM UPCHURCH P.G., PH.D.

Dr. Sam Upchurch's report was submitted as an attachment to the cover letter from ACEPD (ACEPD 2020). Dr. Upchurch's report (Upchurch 2020) is a formal technical peer review of the proposed MFLs. He places emphasis on (1) the ability of the proposed MFLs to protect these water bodies from "significant harm" as directed in Chapter (§) 373 Florida Statutes and (2) the utility of the MFLs for water-resource management.

SU 1—page 1, first bullet

The MFL basis report, dated December 2019 and prepared by HSW Engineering, Inc., deals with the appropriate issues for MFL development. The report develops the basis for revising MFLs set in 2013. The 2013 MFL basis document concluded that water had been over-committed and concluded that significant harm had occurred to the rivers. As a result, a Recovery Strategy was required. Part of the Recovery Strategy included development of a new, regional groundwater flow model to replace the one used in 2013.

SU 2—page 1, second bullet

Chapter 373 F.S. requires that "best available data" be used in development of the MFLs. The basis report includes the best available data for the LSF and IR, but not for the PS. Use and manipulation of these data are a subject of this peer review, however.

SU 3—page 1, fifth bullet

The report incorporates several new approaches to MFL development. These include use of the new groundwater flow model (the North Florida and Southeast Georgia [NFSEG] model); use of the System for Environmental Flow Analysis (SEFA), a method for relating riverine flows to such issues as fish passage; and reliance on a Reference Time Frame (RTF) hydrograph, which was used to propose theoretical hydrographs for the rivers assuming that no groundwater withdrawals were present.

SU 4—page 2, first bullet

As a result of use of these new approaches, the basis document concluded that significant harm has not occurred in the rivers and that water is available for additional use. These conclusions are in contrast to the 2013 MFL even though the 2019 and 2013 MFL critical flows are similar for the IR and the critical flow for the LSFE at the Ft. White gage are lower in the 2019 MFL than in the 2013 MFL.

SU 5—page 2, second bullet

My review of the basis document indicates that the proposed MFLs are not adequately supported by the relevant scientific and technical literature and that large uncertainties in the RTF data, including historical pumping data used in development of the NFSEG model, and thresholds used to evaluate Water Resource Values (WRVs) specified in §373 F.S. with SEFA are not well explained or defended.

SU 6—page 2, third bullet

Several of the socio-politically sensitive WRVs, including recreation and aesthetics are not well developed. These WRVs are often neglected because (1) they are hard to quantify and (2) it is assumed that the other WRVs, which are quantifiable, protect these WRVs. Given the issues that currently are important to stakeholders and often dominate the press; these WRVs should be better evaluated and the opinions of the authors defended.

SU 7—page 2, fourth bullet

Priority springs were thought to be protected from harm by the river MFLs. It is my professional opinion that this is not the case and that the springs are not adequately protected. Furthermore adds Dr. Upchurch: It is recommended that this additional work on spring MFL development methods be initiated immediately. The basis document is weak on references and shows little understanding of specific springs and resurgences or spring behavior. MFLs may be possible for priority springs with a better understanding of spring functions and springshed characteristics. Finally, it would be advantageous to develop a comprehensive review of methods that have been utilized for MFLs of Florida springs in order to assist in development of future MFLs.

SU 8—page 2, fifth bullet

The basis document fails to provide sufficient detail to evaluate conclusions contained in the report. The report is poorly referenced and fails to adequately explain karst processes in the study area.

SU 9—page 2, sixth bullet

The RTF hydrograph was used as a baseline for establishing MFLs. There is no discussion of the reliability of historic pumping data, a critical step in the MFL process. This is a serious shortcoming because errors and uncertainties in estimating the RTF river flows cascade through the entire MFL processes. The following peer review enumerates many of the uncertainties associated with the MFL methods. Uncertainties are cumulative, so by the time a MFL is proposed, there may be consequential possible error.

SU 10—page 2, seventh bullet

The SEFA approach is not well defended and many of the critical thresholds used to determine adequate flow conditions for a WRV are based on personal communications and other “soft” sources. There is no adequate validation of the SEFA method, especially in comparison with the PHABSIM methodology, which was utilized in the 2013 MFL basis document and led to the conclusion that water resources had been over committed.

SU 11—page 2, eighth bullet

Transfer of important, flow-related thresholds from one gage to another by ratio-and- proportion methods needs substantial improvement in terms of justification and precedent.

SU12—page 2, ninth bullet

There is a historic precedent used amongst the water management districts that a 15 percent reduction of flow from baseline conditions represents significant harm. This assumption was used for the 2019 MFLs and needs to be justified with appropriate literature citations.

SU13—Page 2, first bullet at top of page

The MFLs for the rivers consist of one flow value and recurrence interval, namely the median flow that protects all WRVs. This conservative approach assumes that the shape MFL-defined curve. If

rigorously followed, there will be no ability to allocate water during high flows or from base flow (flow from springs). It is my opinion that (1) this MFL structure limits water management options and (2) will be difficult to follow. It does, however, make interfacing with a steady state water flow model simple.

SU 14—page 13, first and second bullets

Description of the karst features, including the Cody Scarp, riverine sinks and siphons, and springs is meagre. Few relevant references are cited and there is no significant demonstration of understanding of the hydrogeologic function of the escarpment. The red line shown on Figures 2 and 3 of the main basis report purports to show the Cody Scarp and is attributed to the District. This line does not reflect the scarp, which is a three-dimensional geomorphic feature that begins, on the LSFR, near Worthington Springs and extends westward to just past the River Rise. Springsheds within the Cody Scarp include swallet to spring systems. The spring systems within the Cody Scarp are complex. These complexities are not indicated in the basis document. For example, discharge from the River Rise is largely derived from the river at high discharge and groundwater from the east at low flow.

SU 15—page 13, fifth bullet

The basis report appropriately begins the MFL discussion with the stream gage at Worthington Springs, which is part of the Upper Santa Fe River (USFR) and for which a MFL has been established. The basis document ties the LSFR to this gage but does not cite effects of the USFR MFLs on the LSFR MFLs.

SU 16—page 13, sixth bullet

The USFR MFL basis report anticipated that Olustee Creek, which is downstream from Worthington Springs, would be included in the LSFR MFLs. There have been stream gages on Olustee Creek in the past which are mentioned in the 2019 appendices. Given the proposed phosphate mining in Union and Bradford counties, Olustee Creek flows should be considered in the 2019 basis document. This could range from MFL development based on synthesized data or, at least, discussed in terms of how Olustee Creek relates to the proposed MFL at US 441.

SU 17— page 14

I find the single value MFL based on median RTF flow to be problematic. It would be preferred to see a flow regime specified in the MFL based on multiple WRV thresholds. The single value method that relies upon maintenance of the shape of the flow-duration curve does not allow for permitting exceptions that might make water available under certain circumstances, such as “scalping” of peak flows or permitting of base flow from a spring, both of which would alter the shape of the flow-duration curve and a deviation of the median flow.

SU 18-page 15

Ability to Implement and Practicality of the Proposed MFLs--I have some concerns with this issue. As stated above, there is likely uncertainty with the RTF method. Therefore, identification of available water, or lack thereof, based on the RTF is problematic. Furthermore, use of a single control point at median flow on the RTF flow-duration curve constrains high and low flow conditions in order to maintain the shape of the flow-duration curve. A set of MFLs that specify a regime of flows and recurrence intervals to protect the WRVs affected by high and low flows is preferable, in my opinion, because it allows permitting related to extreme flows as long as the relevant WRV thresholds are not exceeded. Implementation as alluded to in the basis document would suggest that the flow regime is protected by maintaining the shape of the RTF-derived flow-duration curve and simply allowing a shift in median flow and all other points on the flow-duration curve of a specified amount without changing the recurrence intervals at any shifted flow. This will likely be difficult accomplish and uncertainty based on the RTF will be an issue. The shape of the flow-duration curve will be especially hard to maintain if capturing of peak flows for off-line storage and recovery or if base flow is intercepted by permitted water withdrawals from a spring. It is my opinion that reliance on water managers being able to maintain the shape of a flow-duration curve without written guidance is optimistic.

SU 19—references scattered

Problematic uncertainties

Were “Best Available” Data Utilized? In terms of hydrological data, yes. See the above discussions of this topic. Literature citations, especially those that characterize the study area and ecological/habitat systems, karst, and uncertainties, are limited in the basis document and appendices

Adequacy of Data Used to Support the Proposed MFLs See the comments above. Data are probably adequate and the best available, but they are not fully validated as being adequate or reliable in the basis document or appendices. Statistical methods used to fill data gaps in the stream-flow time series are widely used and considered to meet industry standards. However, discussions of “goodness of fit” and uncertainty were not presented in the basis document. These discussions may be in the appendix.

Use of SEFA to establish WRV thresholds is an advancement over PHABSIM. However, the appendix discussing the methods in detail is weak and does not provide confidence to the reader and water manager in the method. The discussion in the basis document should include considerations of applicability to the LSFR and IR, uncertainties, and improvements over traditional methods, such as PHABSIM.

WRV discussions are good, but some of the threshold values are based on personal communications or presentations at technical meetings. If possible, peer-reviewed thresholds should be utilized. If the only authoritative threshold source is a personal communication or “gray literature”, any uncertainty should be revealed.

SU 20—page 16

Ability of the MFLs to Define a Hydrologic Regime—Taken verbatim, the MFLs do not specify a regime. A flow regime is maintained only if the MFL is managed so that the shape of the flow-duration curve never changes.

SU 21—page 16

Technical Need for a Recovery Strategy--The 2019 basis document indicates that there is less available water available than the 2013 MFL document allowed in the LSFR at the Ft. White gage and the same water availability in the IR. Based on the allowed flow reductions from the new RTF flow-duration curve, there is water available at both LSFR gages and in the IR (Table 33, 2019 basis document). As a result, there is no indication of the need for a Recovery Plan in the 2019 basis document. The lack of need for a Recovery Strategy should be discussed in the 2019 basis document, especially in consideration of the 2013 MFL basis document which found that water in both the LSFR and JR had been over committed and that a Recovery Plan was merited. The development of a Recovery Plan in 2013 was, in part, a result in uncertainties in the MFL and historic flows after removal of permitted uses.

SU 22—page 16

Approach of the MFLs to Natural Stresses, Such as Climate Change and Natural Hydrological Cycles--Climate change and hydrologic cycles are mentioned in the basis document, but they are not directly addressed in terms of the MFLs and management of water availability.

SU 23—page 16

Appropriateness of Statistical Methods and Conclusions--The statistical methods are appropriate. There is a need for uncertainty analysis concerning detailed hydro logic data gap filling methods and development of the RTF data.

LIQUID SOLUTIONS GROUP (LSG)

LSG submitted comments on January 30, 2020 (LSG 2020). Their submittal was made on behalf of the North Florida Utilities Coordinating Group (NFUCG). LSG's evaluation identified several significant concerns with the analyses documented in the Draft MFL Report as follows:

LSG 1—page 1

Calculation of historical flow for Lower Santa Fe River (LSFR) at US 441 gage

The accuracy of the multiple linear regression (MLR) equation used to estimate flows at US 441 is inadequate for use in this process

The required statistical conditions for use of MLR are not met

LSG 2—page 1

Methods for estimating water resource values (WRVs) for the LSFR upstream of US 441. The WRVs used for the US 441 gage are mathematically-derived from work related to the Ft. White gage without adequate field work or modeling

The mathematical method used for derivation of a WRV at the US 441 gage is not technically-based and inappropriate for application.

LSG 3—page 1

Estimates of historical pumping impacts on LSFR. The North Florida Southeast Georgia (NFSEG) groundwater model is poorly calibrated at the US 441 gage leading to inaccurate impact calculations. The NFSEG model shows anomalous impacts at springs along the LSFR which affect the calculation of historical pumping impacts

LSG 4—page 1

Proposed allowable change in flow on the Ichetucknee River (IR). The proposed allowable change of 2.8% is out of the typical range for spring MFLs throughout the state of Florida and requires justification

- a. *The 15% change used as a standard to prevent significant harm for WRVs is based on precedent alone and not justified by the data presented in the report*

LSG 5—page 1

The analyses performed to date do not support the use of the US 441 gage as an MFL location for the LSFR. Neither the accuracy nor precision required for a reliable and technically-sufficient MFL can be provided at this location. Until more data is collected, protection of the LSFR should be provided by the downstream gage at Ft. White. Furthermore, as documented herein, additional work and analyses are required in order to justify the use of the proposed IR MFLs.

FLORIDA SPRINGS INSTITUTE (FSI)

The Florida Springs Institute (FSI) submitted comments on January 24, 2020. Their comment package consisted of a three-page letter report from Robert Knight, Ph.D. Executive Director, and an attached 20-page slide presentation from the Santa Fe River Springs Protection Forum, August 23, 2018.

FSI 1--page 2

It is also a documented fact that the springs along the Santa Fe River are discharging an annual load of anthropogenic nitrate-nitrogen between 1,000 and 2,000 tons to the Santa Fe River, and ultimately to the Suwannee River and Gulf of Mexico. Your own data published in the 2013 MFL report documented that there is a clear and significant inverse relationship between river flow and nitrate concentrations. To state the obvious, lowered flows exacerbate nutrient pollution in the rivers.

FSI 2--page 2

Groundwater quantity and quality must be considered together as a holistic system to solve these worsening problems.

- *In 2012 DEP adopted a basin-wide water quality action plan for the Santa Fe and Ichetucknee rivers. That plan required a 50 percent reduction in nitrogen fertilizer loading for the 1,800 square mile Santa Fe Springshed that feeds groundwater to more than fifty springs that flow into these rivers.*
- *In 2014 the Suwannee and St. Johns Water Management Districts completed a multi-year study of the Santa Fe and Ichetucknee rivers and concluded that both waterways were beyond the point of significant harm due to excessive groundwater pumping.*
- *In 2015 the Florida Department of Environmental Protection in association with the Districts, implemented a prevention and recovery strategy to comply with the Santa Fe and Ichetucknee minimum flow requirements.*
- *In 2018 DEP revised the Santa Fe Basin Management Action Plan in the face of the 2012 plan utterly failing to reverse continuing water quality degradation.*
- *And now, at the end of 2019 and early 2020 the DEP and the Districts are back, revising their failed 2015 MFLs.*

FSI 3--page 2

In the Santa Fe Springshed 2,100 new well permits were issued since 2015 when the Districts and DEP assured the public that we had entered a “prevention and recovery” period for these water bodies.

Every well permit that allows more groundwater to be withdrawn from the aquifer also facilitates the application of more fertilizer to ag fields or lawns. The resulting depletion and pollution of our region’s groundwater is a double blow to the health of our drinking water and local springs.

FSI 4--page 2

Analysis of the actual USGS discharge data for the MFL stations was summarized and reported to District staff in August 2018 (see attached). Median flows in the Santa Fe River at the US 47 Gauge are down 28 percent for the period 2000 to 2017 compared to flows recorded at that location before 2000. Median flows averaged over the past two decades are only about 800 cfs compared to the District’s recommended MFL median flow of 1,167 cfs. The new MFL and the old MFL are not being achieved.

FSI 5--page 3

The fact that the District’s draft MFL authorizes a flow reduction of 114 cfs (74 MGD) while actual, multi-decadal flows are already 509 cfs (329 MGD) lower than historic flows, proves that this new MFL is already violated and not in the public’s legitimate best interests. FSI recommends that this new MFL mandate the recovery of 395 cfs (255 MGD) (the difference between 509 and 114 cfs) of lost flows by substantially reducing all existing water use permits in the region.

Large springs that were never observed to stop flowing in the past, have stopped flowing multiple times during recent drought periods. Springs that were translucent-blue 25 years ago are now green-brown and most of their plants and fish are gone. Rivers and springs that were pristine as recently as 40 to 50 years ago are now terribly polluted and depleted as a result of poorly regulated human activities.

FSI 6--page 3

The science is clear – the aesthetic and economic health of our local rivers and springs is being lost as groundwater withdrawals and fertilizer inputs increase, one gallon and one pound at a time. The springs that provide the base flow of the Santa Fe and Ichetucknee Rivers are suffering a “death by a thousand cuts”.

FSI 7--page 3

For the health and vitality of our region's priceless springs, we recommend that no new wells be permitted, and no expired permits be re-issued until a greater volume of existing groundwater use is eliminated from those existing permits.

We respectfully request that DEP use its authority to expeditiously restore the Santa Fe and Ichetucknee Rivers and Springs.

ICHETUCKNEE ALLIANCE, INC. (IA)

The Ichetucknee Alliance (IA) submitted comments on March 12, 2020 (IA 2020). Their comment package consisted of a four-page technical memorandum from John Jopling, President.

IA 1—page 2

The document fails to meet legal requirements, is not protective, and will result in significant harm. The Alliance believes that the draft MFL fails to meet the statutory requirements under 373.042, is not protective of the Ichetucknee River, and will result in significant harm to the Ichetucknee's Outstanding Florida Springs. Per the Florida Springs Council's letter referenced above:

IA 2—page 2

The document's MFL proposal is negligent. As cited in comments by the Florida Springs Council (FSC), the draft MFL's proposal for a less protective rule that enables increased pumping—which will inevitably harm already diminished Outstanding Florida Springs—is negligent.

IA 3--page 2

The document could remove an existing protection. Also, per comments by FSC, the Alliance is alarmed that the draft MFL could trigger a provision in 373.805(3) that allows for adoption of the MFL without concurrently adopting a recovery or prevention strategy. We object to the removal of an existing protection for the Outstanding Florida Springs along the Ichetucknee River that would allow additional pumping and result in further degradation of these springs.

IA 4--page 2

The document contains a false statement. In regard to Water Resource Value (WRV) 5, Maintenance of Freshwater Storage, the statement on page 57 is false: "While this WRV is considered relevant, it is afforded protection by the permitting process...". The permitting process is not protecting water security of the Upper Floridan aquifer, per several graphics included in the letter from Robert L. Knight of the Florida Springs Institute that was sent to Kristine Papin Morris of DEP on January 24, 2020: "Increased Groundwater Pumping Lowers Aquifer Pressure (levels)"; "Ichetucknee River Flows Are Declining in Spite of Relatively Constant Rainfall"; and "Ichetucknee River Rainfall vs. Discharge (1930- 2017)" that shows a 21 percent flow reduction (76 cubic feet per second) independent of rainfall. We also refer you to the long-term groundwater level decline demonstrated at the Florida Department of Transportation's Lake City monitoring well as reported monthly in the hydrologic conditions report issued by the Suwannee River Water Management District (see attached graphic).

IA 5--pages 2-3

The document relies on insufficient data and ignores the Precautionary Principle. The use of insufficient data is troubling, per this statement on pdf page 64 (document page 56) of the Technical Report: "More often, available data are insufficient to quantify the flow characteristics that are protective of a WRV, and assumptions and professional judgment are needed to develop protective criteria." This is a classic case of how the Florida Department of Environmental Protection and the water management districts

should be applying the Precautionary Principle: When in doubt, choose the course of action that causes the least amount of environmental harm until doubt can be resolved

IA 6--page 3

The document relies on outdated information and ignores the Precautionary Principle. Also on pdf page 64, the Alliance is troubled by this statement: "Although the federally endangered West Indian manatees visit the springs, none of the springs on the LSFR or IR have been identified as significant thermal refugia for manatees (Warm Water Task Force 2004)." Here, a 16-year-old report is driving a decision to ignore manatees when we know that these animals are losing refugia as coastal power plants go offline and as their use of the Ichetucknee appears to be increasing. Additionally, when water levels drop in the Ichetucknee River, manatees are unable to cross the limestone shelf at the river's confluence with the Santa Fe. This situation at the confluence must be considered in the revised MFL. The situation with manatees is another case in which the Precautionary Principle should be invoked in order to ensure that manatees can continue to gain access to the Ichetucknee.

IA 7--page 3

The document ignores damage to an aesthetic and scenic attribute. In regard to WRV 6, Aesthetic and Scenic Attributes (pdf page 65), there should be acknowledgement that the proliferation of algae on submerged aquatic vegetation and in the Ichetucknee River and springs—a proliferation that has been linked to pollution as well as to loss of flow—is a clear example of aesthetic degradation.

IA 8--page 3

The water model used in development of the MFL is flawed. The Alliance questions the suitability and reliability of the North Florida-Southeast Georgia (NFSEG) Groundwater Model in areas of karst environments such as those that surround the Ichetucknee.

IA 9--page 3

The MFL fails to consider the connections between flow (water quantity) and water quality. The Alliance also believes that the Florida Department of Environmental Protection and the water management districts need to develop a system to link water quality and water quantity in evaluations such as the MFLs, because these two things are interconnected--not separate.

FLORIDA SPRINGS COUNCIL (FSC)

The FSC submitted comments on February 5, 2020 (FSC 2020). Their comment package consisted of a three-page letter report from Ryan Smart, Executive Director.

FSC 1--page 1

Based on the above, we believe that the draft MFL fails to meet the statutory requirements under 373.042, is not protective of the Santa Fe and Ichetucknee Rivers, and will result in significant harm to Outstanding Florida Springs.

In November of 2013, the SRWMD adopted an interim MFL for the Lower Santa Fe River, Ichetucknee River, and Priority Springs. As part of the MFL, the SRWMD found that significant harm to water resource values was occurring, requiring the development of a recovery plan. Despite the adoption of a document the District classifies as a recovery plan, approximately 2,100 new well permits were issued within the springshed since it went into effect in 2015. The Florida Springs Institute's analysis of USGS discharge data, the same data utilized by SRWMD to develop the draft MFL, found a 28 percent decrease in flow from 2000 to 2017 at the US 47 gauge, when compared to pre-2000 data. These data

indicate that the river systems are already experiencing significant harm from decreased flows. The continuing downward trend in flows (when adjusted for rainfall) further indicates that the "recovery plan" has failed to yield restoration benefits. For these reasons, we challenge the draft MFL report's assertion that additional flow reductions should or can be permitted

FSC 2--page 2

Of greatest concern, is that the proposed MFL is not designed to protect Outstanding Florida Springs. The Florida Springs and Aquifer Protection Act (FSAPA), signed into law in 2016, requires the adoption of MFLs for 30 Outstanding Florida Springs, including several within the Santa Fe River basin. However, the draft MFL only sets minimum flow levels in the rivers, not in the Outstanding Florida Springs. As Mr. Upchurch points out in his peer review, "The basis document concludes that the priority springs are protected by the riverine MFLs. This conclusion is problematic given the relatively small contribution of individual springs..." He goes on to say that the draft MFL is "weak" and "shows little understanding of specific springs and resurgences." Mr. Upchurch concludes "the proposed riverine MFLs do not adequately protect the springs."

FSC 3--page 2

The proposed MFL also appears to be in contradiction with the very intent of the FSAPA. Section 373.801(3)(b) states, "Many of this state's springs are demonstrating signs of significant ecological imbalance, increased nutrient loading, and declining flow. Without effective remedial action, further declines in water quality and water quantity may occur." Section 373.901(4) clarifies that such "action is urgently needed." In fact, the Legislature found the need for more protective MFLs so urgent that it "authorized and found that all conditions are met, to use emergency rulemaking provisions" to adopt MFLs (373.042(2)(c)). Considering this legislation, the draft MFL's proposal for a less protective rule and increased pumping, which will inevitably harm already diminished Outstanding Florida Springs, is negligent.

SYNTHESIS

Table 1 provides my synthesis of seven sets of substantive review comments submitted to the District on the proposed MFLs for the Upper Santa Fe and Ichetucknee Rivers and Priority Springs. Included are the PRP's as summarized by Dunn 2020b. The six other substantive comment sets were from: Alachua County EPD, Sam Upchurch, P.G., Ph.D., Liquid Solutions Group (LSG), Florida Springs Institute (FSI). Ichetucknee Alliance, (IA), and Florida Springs Council (FSC).

Table 1 provides a tabular cross-referencing ledger aligning the seven sets of reviewer's substantive comments by twenty-four substantive comment categories. The first 17 categories are extracted from the PRP's summary (Dunn 2020b, included as Attachment A). The next 7 are derived from comments made by either Sam Upchurch, or FSI. The seven additional items are as follows

- #18 Priority springs are not protected
- #19 Karst hydrogeology not properly addressed
- #20 Problematic implementation of MFL
- #21 Significant harm and the 2013 Recovery Plan
- #22 Existing MFL exceeded
- #23 Proposed MFL will be exceeded
- #24 Moratorium and roll back on water use.

Table 1 show us that 24 substantive issue categories align positively across multiple to all seven reviewer groups.

Comment set by Upchurch was the most detailed of those submitted. Dr. Upchurch submitted a full MFLs peer review following the Ch 373 guidelines for technical peer review. All six public submittals align quite strongly with the PRP's 17 key issues. SU aligns very strongly with the PRP. Likewise, the three additional categories (18, 19, and 20) authored by Dr. Upchurch have broad overlap with PRP's review.

Table 1 gives comparative groupings and linking alignments across the seven review sets. In any structured follow up to this inventory of substantive comments the District and HSW will also have to go to the detailed individual comment, whether it is a technical comment, a question, or a recommendation for action.

Table 1. Comparative summary of technical review comments by Peer Review Panel (PRP) and six comment sets submitted by public. Summary grouped by categories of substantive comments, those that can significantly affect outcome of MFL setting, adoption, implementation, and use as water management constraint.

Category of Substantive Comments	Peer Review Panel (PRP)	Alachua County EPD	Sam Upchurch	Florida Springs Institute	Liquid Solutions Group	Ichetucknee Alliance	Florida Springs Council
	Aligned Comments	Aligned Comments	Aligned Comments	Aligned Comments	Aligned Comments	Aligned Comments	Aligned Comments
1--Historic Groundwater Levels and Springs Flows	Author: PRP 1	AC 1	SU 2, SU 5, SU 9, SU 14, SU 15	FSI 3, FS 14, FSI 5	LSG 1, LSG 3		
2--Impacts of Historic Water Use	Author: PRP 2	AC 1	SU 5, SU 9, SU 14, SU 15	FSI 3, FSI 4, FSI 5	LSG 3,		
3--RTFs	Author: PRP 3	AC 1	SU 3, SU 5, SU 9, SU 14, SU 15	FSI 3,FSI 4, FSI 5	LSG 1, LSG 3, LSG 5	IA 8	
4--Rating Curves for Springs	Author: PRP 4	AC 1	SU 2, SU 5, SU 7, SU 9, SU 14, SU 15	FSI 3, FSI 4, FSI 5	LSG 3, LSG 5	IA 8	
5--Data Infill for Time Series	Author: PRP 5	AC 1	SU 2, SU 5, SU 11, SU 16		LSG 1, LSG 3, LSG 5		
6--AMO Signal	Author: PRP 6		SU 22				
7--Development of RTFs	Author: PRP 7	AC 1	SU 3, SU 5, SU 9, SU 11, SU 14, SU 16	FSI 3, FSI 4, FSI 5	LSG 1, LSG 3,	IA 8	
8--Use of Reach Apportionment Method	Author: PRP 8		SU 11				
9--MFL Setting Process	Author: PRP 9	AC 3, AC 4	SU 1, SU 2, SU 3, SU 4, SU 5, SU 6, SU 7, SU 8, SU 10, SU 12, SU 13, SU 17, SU 18, SU 20	FSI 1, FSI 2, FSI 3, FSI 5, FSI 7	LSG 1, LSG 2, LSG 4, LSG 5	IA 4, IA 5, IA 6, IA 7	FSC 1, FSC 2
10--Parameterizing WRVs	Author: PRP 10	AC 3, AC 4	SU 1, SU 2, SU 3, SU 4, SU 5, SU 6, SU 7, SU 8, SU 10, SU 12, SU 13, SU 17, SU 18, SU 20	FSI 1, FSI 2, FSI 3, FSI 5, FSI 7	LSG 1, LSG 2, LSG 4, LSG 5	IA 4, IA 5, IA 6, IA 7	FSC 1, FSC 2
11--Follow up on 2013 Peer Review	Author: PRP 11	AC 3, AC 4	SU 11		LSG 4		
12--Seasonality	Author: PRP 12		SU 3				FSC 3
13--Nexus of Water Quality & Flow Regime	Author: PRP 13			FSI 1, FSI 2		IA 7, IA 9	
14--Climate Change Impacts not addressed	Author: PRP 14	AC 2	SU 22				
15--Update Science	Author: PRP 15	AC 1, AC 2, AC 3	SU 3, SU 5, SU 7, SU 8, SU 10, SU 11, SU 13, SU 17, SU 18	FSI 6	LSG 2, LSG 4, LSG 5		
16--Manging Uncertainty	Author: PRP 16	AC 1, AC 2, AC 3, AC 4	SU 2, SU 5, SU 6, SU 7, SU 8, SU 9, SU 10, SU 16, SU 17, SU 18, SU 19, SU 21, SU 22, SU 23	FSI 5, FSI 7	LSG 1, LSG 2, LSG 4, LSG 5	IA 1, IA 2, IA 5, IA 6, IA 7	FSC 1, FSC 2, FSC 3
17--Applying Adaptive Management	Author: PRP 17	AC 1, AC 2, AC 3, AC 4	SU 2, SU 5, SU 6, SU 7, SU 8, SU 9, SU 10, SU 17, SU 19, SU 21, SU 22, SU 23	FSI 1, FSI 2, FSI 6, FSI 7	LSG 2, LSG 4	IA 1, IA 2	FSC 1, FSC 2, FSC 3
18--Priority Springs not protected	PRP 9-10, PRP 15-17		Author: SU 7	FSI 1, FSI 2		IA 1, IA 2	FSC 1, FSC 2, FSC 3
19--Karst hydrogeology not properly addressed	PRP 9-10, PRP 15-17		Author: SU 14			IA 8	FSC 1, FSC 2, FSC 3
20--Problematic implementation of MFL	PRP 9-10, PRP 15-17	AC 3, AC 4	Author: SU 18	FSI 1-7	LSG 5		FSC 1, FSC 2, FSC 3
21--Significant harm has occurred	PRP 9-10, PRP 15-17	AC 4		Author: FSI 2		IA 1, IA 2, IA 3	FSC 1, FSC 2, FSC 3
22--Existing MFLs are exceeded	PRP 9-10, PRP 15-17	AC 4		Author: FSI 2		IA 2, IA 3	FSC 1, FSC 2, FSC 3
23--Proposed MFLs will be exceeded	PRP 9-10, PRP 15-17			Author: FSI 2		IA 2, IA 3	FSC 1, FSC 2, FSC 3
24--Declare Moratorium on Water Use Permits	PRP 9-10, PRP 15-17			Author: FSI 2		IA 2, IA 3	

All 24 categories raise substantive issues that should be addressed by the District and HSW. Collectively the submitted reviews from the PRP and public and third parties provide the District with very detailed technical feedback on the entire MFL setting process. Table 1 shows the breadth and depth of review comments, but details will need to be addressed via individual comments in each of the seven sets of reviews.

Comment sets by PRP (Dunn 2020a, Dunn 2020b), and Sam Upchurch (Upchurch 2020) were done as formal technical peer reviews for MFLs following the Chapter 373 protocols. The point here is that formal peer reviews must address a detailed set of questions regarding the quality of the MFLs recommended, and the MFLs setting process, the quality and reliability of data, tools and models used, and the ability to implement the proposed MFLs. PRP's collective comments by the three individual peer panel members were already summarized in Dunn 2020b. This means that this synthesis includes four individual, independent, formally structured technical peer reviews. Collectively, this is a strong technical basis for a comprehensive peer review.

Across the seven sets of substantive comments submitted, the total number of substantive review comments is 143. Furthermore those 143 substantive comments are allocated into 24 topical categories. As noted in PRP's summary (Dunn 2020b) each substantive comment identifies a source of uncertainty, this holds true again with this hierarchical evaluation across the seven sets of reviews.

This inventory and analysis gives the District a comprehensive analysis of substantive uncertainties. Uncertainties can pose risks. The primary risk is that the water resource values of the Lower Santa Fe and Ichetucknee Rivers and their Priority Springs will not be protected from significant harm. Reducing the potential for significant harm from the identified problematic uncertainties is the management challenge now. How should we approach this next challenge?

Adaptive Management is designed to assist resource managers with managing in the face of uncertainties and associated risk, the risk of significant harm to the water resources of the District. Table 1 makes the path forward on this challenge look quite manageable.

RECOMMENDED PATH FORWARD

There is a clear path forward to the completion of this MFLs reevaluation for the Lower Santa Fe and Ichetucknee Rivers and their priority springs. I return to my repeated advocacy that effective water resources management, including setting and implementing MFLs occurs adaptively once we understand and manage risk and uncertainty. I submit that this document's synthesis of substantive review comments is an inventory and analysis/evaluation of sources of uncertainty affecting the setting of MFLs for the two rivers and their associated priority springs. Each substantive, problematic uncertainty has downside risk potential to the sustainable management of the LSFR & IR and their priority springs, and their protection from significant harm as directed in Chapter 373 F.S.

This inventory of risk from substantive uncertainties is an excellent restarting point for moving forward, continuing to develop MFLs for these water bodies that do meet the directives of Chapter 373 F.S. It is also an essential step in an AM approach. As water resource managers we must do the best possible job managing our precious water resources, but do so under currently constraints, to develop MFLs that protect from these water bodies from significant

harm. This is a tough challenge, but it is one that we can conquer. We will succeed by using an AM process to manage uncertainty and risk in the long run by structured learning. In doing this we will be able to make better management decision in the future with less downside uncertainty and risk. This outcome will result from a flexible, goal seeking, adaptive approach to risk reduction. Asking ourselves how can we do a better job next time? The answer is that we need a systematic AM approach.

Finally I go back to PRP's substantive issues¹⁶ and 17 (Dunn 2020b, Attachment A, and Table 1 herein above), which together call: 1) for uncertainty and risk analysis to identify problematic sources of uncertainty that could increase the risk of significant harm occurring, and 2) the use AM to smartly manage these precious water resources in the face of risk and uncertainty. In AM we hope to do the best job we can under limits of uncertainty but use structured learning to be better managers in the future. Adaptive learning yields adaptive management.

WHAT'S NEXT IN PEER REVIEW PROCESS?

This summary once submitted and accepted by the District will be made available to public, as the individual reviews have already. The ongoing formal peer review process will include two public meetings. The public meetings will serve: 1) to present these findings and recommendations, 2) allow the three panel members to discuss findings and recommendations, and 3) to take further public comment. The first public meeting is presently scheduled for June 16, 2020. Following the first public meeting, the Chair will refine the panel's findings and recommendations, as needed and will produce his second summary report. Following a subsequent public review period, a second public meeting of the panel will take place following the same format as the first meeting. The outcome of the second public meeting will be the Chair's final report.

REFERENCES

Alachua County Environmental Protection Department (EPD). 2020. Cover letter and summary comment report submitted by Chris Bird, February 5, 2020.

Dunn, W.J. 2020a. Peer Review Form: Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District. Submitted February 21, 2020. Prepared by Barnes Ferland Associates (BFA), Inc., Orland FL.

Dunn, W.J. 2020b. Draft Chair's Peer Review Panel Consensus Report for: Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District. Submitted March 9, 2020. Prepared by Barnes Ferland Associates (BFA), Inc., Orland FL.

Florida Springs Council. 2020. Florida Springs Council Comments o Draft Minimum Flows and Levels Re-evaluation for the Lower Santa Fe River, Ichetucknee River, and Priority Springs. Letter report submitted by Ryan Smart, February 5, 2020, 3 p.

Florida Springs Institute. 2020. Re-evaluation of Minimum Flows and Levels for the Santa Fe and Ichetucknee Rivers and Springs. Letter Report from R.L Knight, January 24, 2020, 3 p.

HSW Engineering, 2019. Draft: Minimum Flows and Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District, December 2019, 119 p.

Ichetucknee Alliance, Inc. 2020. Comments on December 2019 Draft Technical Document on Minimum Flows and Minimum Water Levels (MFLs) for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Letter Report submitted by John Joplin, March 12, 2020, 4 p.

Liquid Solutions Group, LLC. 2020. Preliminary Review Comments on the Minimum Flows and Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Draft Report Released on December 20, 2019. January 30, 2020, 15 p.

Motz, L.H. 2020. Peer Review Form: Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District. Submitted February 18, 2020.

Munson, A. 2020. Peer Review Form: Minimum Water Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Prepared for the Suwannee River Water Management District. Submitted February 18, 2020.

Upchurch, S.B. 2020. Peer Review Summary Report: Minimum Flows and Minimum Levels Re-evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs. Letter report submitted January 17, 2020, revised February 3, 2020, 16 p.

Attachment A

Draft: Chair's Peer Review Panel Consensus Report for: Technical Report-Minimum Flows and Minimum Levels Re-Evaluation for the Lower Santa Fe and Ichetucknee Rivers and Priority Springs

PREPARED FOR



Suwannee River Water Management District

PREPARED BY: WILLIAM J. DUNN.

BFA Environmental Consultants
Barnes, Ferland and Associates, Inc.

MARCH 9, 2020

INTRODUCTION

OVERVIEW

The Suwannee River Water Management District (District) has included an MFLS re-evaluation for Lower Santa Fe and Ichetucknee Rivers and their associated priority springs in 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, the District has identified these MFLs for independent scientific peer review.

These recommended MFLs are described in a document titled ***Minimum Flows and Minimum Levels Re-evaluation for Lower Santa Fe and Ichetucknee Rivers and Priority Springs Draft Report December 2019***, prepared for the District by HSW Engineering, Inc. (HSW).

BACKGROUND

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.

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.

SUMMARY OF PEER REVIEW PANEL'S FINDINGS AND RECOMMENDATIONS

This is the first draft of the Chair's Consensus Report. The report section provides a summary of individual and collective findings and recommendations based on the substantive comments made by each reviewer. The individual Peer Review Forms already completed independently by panel members are included as attachments.

The three independent technical peer reviews with their respective fields of expertise are:

- Dr. Louis Motz, P.E.—Water resources engineering, groundwater modelling
- Dr. Adam Munson, P.E.—MFLs development, statistical methods, riverine ecology
- Dr. William Dunn—MFLs development, systems ecology, wetland & aquatic ecology, analysis of uncertainty, and adaptive management

Dr. Dunn chaired the peer review panel. He is author of this report.

At the District's request this peer review was conducted according to the State of Florida's government in the Sunshine rules. The key requirement is that the three peer reviewers cannot interact with each other, or as a group except in a publicly noticed, publicly accessible forum.

Importantly, the District's instructions for this peer review request each reviewer identify substantive comments which the District defines as those that have the possibility of causing a change to the report's conclusions including its recommended MFLs. The determination of substantive comments is embedded in a simple Yes or No question in the District's peer review form. The question is asked of each individual comment from each reviewer. The peer review reports already submitted independently are included as attachments:

- Attachment A: Dr. Dunn's report
- Attachment B: Dr. Motz's report
- Attachment C: Dr. Munson's report

SUMMARY OF SUBSTANTIVE AND NON-SUBSTANTIVE REVIEW COMMENTS

For this peer review substantive comments are defined as those that each reviewer flagged as Yes in response to the question—does the comment directly and materially affect the conclusions of the report? Each yes-flagged comment is thus an issue of concern, a problem, a question, a need for additional information, or a recommendation for an alternative. These are the sources of uncertainty in the eyes of each reviewer. Individually and collectively they are the active part of the peer review. A statistical summary quickly shows patterns.

Each of the attached Peer Review Reports (Attachments A, B and C) summarizes the reviewer's individual general and specific review comments on HSW's MFLs report along with any recommended actions (Table 1 in each of Attachments A, B, and C). In these three summary tables each comment is treated as a separate row. Comments are grouped by sections of HSW's document. HSW's MFLs report has seven sections and six appendices in a separate document.

Table 1 provides a statistical summary of panel members' comments, broken down by individual sections of HSW's MFLs report, including its six appendices. The summary also includes a yes or no flag as to whether the issue is a substantive one, that is one that can directly and materially affect the conclusions of the report.

Table 1. Statistical summary of review comments by individual reviewer, broken out by HSW's report section. Includes yes/no answer to question: Does comment directly and materially affect conclusions of report?

Section of HSW's MFLs Report	Dunn			Motz			Munson			Panel's Summary		
	#	Does It Affect Conclusions?		#	Does It Affect Conclusions?		#	Does It Affect Conclusions?		#	Does It Affect Conclusions?	
		# Yes	# No		# Yes	# No		# Yes	# No		# Yes	# No
1--Introduction	1	0	1	1	0	1	0	0	0	2	0	2
2--Hydrology	20	0	20	14	9	5	10	6	4	44	15	29
3--Biology	18	3	15	0	0	0	2	0	2	20	3	17
4--Approach to Setting MFLs	16	5	11	3	0	3	1	0	1	20	5	15
5--Evaluation of WRVs	33	31	2	0	0	0	4	2	2	37	33	4
6--River MFLs Development	15	15	0	2	1	1	1	0	1	18	16	2
7--Priority Springs Assessment and MFLs Development	6	4	2	6	3	3	1	0	1	13	7	6
subtotal	109	58	51	26	13	13	19	8	11	154	79	75
Appendix A--Priority Springs	1	0	1	0	0	0	0	0	0	1	0	1
Appendix B--Water Use Hindcasting	2	0	2	9	7	2	0	0	0	11	7	4
Appendix C--Reference Timeframe Flow Methodology	1	0	1	6	6	0	1	0	1	8	6	2
Appendix D--HEC-RAS Model	1	0	1	0	0	0	0	0	0	1	0	1
Appendix E--WRV Duration Curves	1	0	1	0	0	0	0	0	0	1	0	1
Appendix F--SEFA Rating Curves and Area Weighted Suitability Evaluation Results	1	0	1	0	0	0	0	0	0	1	0	1
subtotal	7	0	7	15	13	2	1	0	1	23	13	10
Grand Total	116	58	58	41	26	15	20	8	12	177	92	85

Dr. Dunn provides 116 total comments with 109 and 7 respectively for report and appendices. For the report 58 comments are flagged as Yes. This sum is 73% of the total Yes flags by the panel. These are arrayed across sections 2 through 7 of the MFLs report. His comments account for most yes-flags for report sections 3 through 7. Dr. Dunn provided summary in his initial report (Attachment A). His Attachment A Table 1 lists 18 General Comments that are a distillation of yes-flags covering the entire report. His initial report also provided a text summary of the findings and conclusions. Dr. Dunn's substantive comments cover the following issues:

- MFLs Setting Process is Yet Incomplete (See Attachment A, Dr. Dunn's Comments G1, G2),
- Process of parameterizing WRVs should be redone following recommendations (Dunn Comments G4, G6),
- Substantive comments in 2013 peer review of the current MFLs by the University of Florida were not completely addressed, these remain highly relevant today and should be addressed (Dunn Comments G5),
- Seasonality should be addressed comprehensively (Dunn Comments G11),
- Water Quality links to flow and level regimes need to be more deeply explored based on emerging research (Dunn Comments G14),
- Climate Change is not addressed, it needs to be (Dunn Comments G16),
- Update Underlying Science for approach to setting MFLs (Dunn Comments G8),
- Report lacks a comprehensive approach to Managing Uncertainty (Dunn Comments G10),
- Adaptive Management should be considered as the general approach to setting MFLs (Dunn Comments G9, G15).

In his report (Attachment B) Dr. Motz provides 42 comments in total, 26 on the report, and another 16 on Appendices B and C. Of the 26 on the main report, 13 are flagged Yes as being substantive. These focus on the following topics:

- Asks questions regarding additional data sources for groundwater monitor wells (Motz Comment 5) and spring flows (Motz Comments 6 and 7),
- Requests expanded discussion on estimates of impacts of historic groundwater use (Motz Comments 13, 14 and 15),
- Asks questions and makes suggested text changes in HSW's coverage of the development of the Reference Timeframe Flows at three gages (Motz Comments 12, 13, 14, 15 and 19),
- Comments on problems encountered with rating curves for springs (Motz Comments 22, 24 and 26).

In his report (Attachment C) Dr. Munson provides 20 comments, 19 on the report, and one for Appendix C. Eight of 19 comments on report are flagged Yes. Substantive issues identified are:

- Asks questions and requests additional supporting analyses for infilling data in hydro time series using multiple linear regression (MLR) method (Munson 4 and 5),
- A caution not to easily dismiss the presence of an AMO signal. He points to the range of AMO patterns observed by Kelly (2004) for rivers in Florida. Dr. Munson notes that the AMO pattern may be bimodal (Munson Comments 6 and 7),
- Requests additional discussion clarifying: 1) choices made for period of record for annual water use estimates for groundwater use (Munson Comments 9 and 2), question on RTF issues (Munson Comment 10),
- Requests additional discussion of the appropriateness of using reach apportionment methods for setting MFLs (Munson Comments 17 and 18).

Lack of comments on a given section of the MFLs report, and a predominance of No-flags given by panel members in tables are taken as general approval of those report sections. This is the case for report sections 1, and Appendices A, D, E and F.

The report gets good grades on overall water resources engineering and hydrology. Panel generally concurred with the data sources used, statistical and analytical methods applied, and the surface water and groundwater modeling selected, applied and presented. A major goal of this collected effort was to generate time series of daily flow and stage sequences for LSFR and IR with historic groundwater use, and without.

Drs. Motz and Munson by the nature of their respective fields of expertise focus on hydrology and water resource engineering issues in report Section 2, 5, 6 and 7. Dr. Motz makes significant comments to sections 2, 6 and 7, while Dr. Munson confines to 2 also and section 5. Their collective eight topics of substantive comments from the Yes flags. For the most part these cover the development of the RTF flow series. They do not provide much substantive comment on Sections 4, 5, and 6, the process of setting the MFLs. Dr. Dunn, however, makes a very significant focus on the MFLs setting process. He makes 55 of his 58 Yes flags on the MFLs setting process from WRV selection, through evaluation of WRVs, to the recommended MFLs.

Reviews by Drs. Motz and Munson focus on the hydrology end of the report, that which yields the time series of flows and levels that are needed to evaluate the potential for harm analysis using the critical WRVs. Section 4 of the report lays out the approach to setting MFLs. It is here where Dr. Dunn finds some problematic decisions on approach and methods. He finds further that the problems cascade forward through evaluation of individual WRVs, the comparative sensitivity analysis of WRVs collectively, and ultimately into the MFLs proposed for both rivers and their priority springs.

There is agreement by all three reviewers that further action is needed to develop individual MFLs for the priority springs.

SUMMARY OF PANELS' FINDINGS AND RECOMMENDATIONS

Overview, as Chair I find that Sections 1, 2, 3, and parts of 4 of HSW's report are on solid basis technically. The resource inventories, data and analytical approaches are scientifically reasonable and appropriate, including data collection, development hydrological data time series, surface water (HEC-RAS) modeling, and the development of the reference flow regime are acceptable. The WRV screening process is well done. The general approach to habitat modeling and assessment using SEFA is also an excellent. Problematic decisions, however, begin in Section 4.2 Indicators and Response Functions, on page 58 and continue onward to end of document.

The substantive issues raised collectively by the reviewers are distilled into seventeen sets of recommended actions. Greater detail on the issue and action can be found in the detailed comments from each reviewer (Attachments A, B and C). These are:

1. **Groundwater levels and spring flows**—Reviewer asks questions regarding additional data sources for groundwater monitor wells (Motz Comment 5) and spring flows (Motz Comments 6 and 7),
2. **Impacts of historic groundwater use**—Reviewer requests expanded discussion on aspects of estimates of impacts of historic groundwater use (Motz Comments 13, 14 and 15),
3. **Generation of RTFs**—Reviewer asks questions and makes suggested text changes in HSW's coverage of the development of the Reference Timeframe Flows at three gages (Motz Comments 12, 13, 14, 15 and 19),
4. **Rating curves for springs**—Reviewer comments on problems encountered with rating curves for springs (Motz Comments 22, 24 and 26).
5. **Infilling Data**—Reviewer asks questions and requests additional supporting analyses for infilling data in hydro time series using multiple linear regression (MLR) method (Munson Comments 4 and 5),
6. **AMO signal**—Reviewer cautions that report should not so easily dismiss the presence of an AMO signal. He points to the range of AMO patterns observed by Kelly 2004 for rivers in Florida. Dr. Munson specifically notes that the AMO pattern may be bimodal (Munson Comments 6 and 7),
7. **Development of RTFs**—Reviewer requests additional discussion clarifying: 1) choices made for period of record for annual water use estimates for groundwater use (Munson Comment 9), and issues concerning estimates of RTFs (Munson Comment 10),
8. **Use of the reach apportionment method**—Reviewer requests additional discussion of the appropriateness of using reach apportionment methods for setting MFLs (Munson Comments 17 and 18),
9. **The MFLs Setting Process is Incomplete**—Reviewer finds that the MFLs setting process for the Lower Santa Fe and Ichetucknee Rivers and their priority springs is incomplete. Overall, Dr. Dunn finds that the proposed re-evaluated MFLs are yet incomplete, since the latter parts of the process are problematic. He recommends that that problem areas be reevaluated and redone. Very specific problems are identified in the definition and setting of indicators and metrics for WRVs, specifically the parameterization of the WRVs as they are used as the defining protective criteria for setting minimum flows and levels. Protective thresholds are set to prevent significant harm. Beyond identifying problems specific recommendations are given to address each problem. These remedial actions if implemented can significantly improve the scientific rigor of this MFLs setting effort. Dr. Dunn's specific comments on this topic are: G2, G3, 6.1, 6.2, 6.4, 6.5, 6.7, 6.8, 6.9, 6.10, 6.11, 6.15, 7.5, and 7.6.
10. **Parameterizing WRVs**—Reviewer finds that HSW's MFLs report has a major shortcoming in setting the proper indicators and metrics for several of the fourteen key WRVs elements.

From this he concludes that reasonable assurance is not provided that the sensitive water resources of the LSFR & IR and their associated springs will be protected by the proposed MFLs. Dr. Dunn recommends that the WRV parameterization process be redone following specific recommendations. This recommendation thus calls for the MFLs development process be rolled back to this point, the WRV parameterization step. Dr. Dunn's specific comments on this topic are: G4, G6, G14, 4.1, 4.5, 4.16, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.8, 5.9, 5.10, 5.11, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.20, 5.21, 5.22, 5.23, 5.25, 5.26, 5.27, 5.28, 5.29, 5.30, 5.31, 5.32, 5.33, 6.1, 6.4, 6.5, 6.7, 6.8, and 6.9.

- On the question of setting proper metrics for WRV of interest Dr. Dunn strongly recommend that whenever relevant and possible protective metrics for the MFLs 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 report's authors selected and applied only a single approach to setting metrics for WRVs, the 15% allowable change developed by SWFWMD. This is identified as key shortcoming.
- He advocates that a toolbox of methods be used to screen and select the best approach to setting WRV metrics. The toolbox should include a full array of options available and used by practitioners. Abundant examples exist from numerous from other MFL WRV metrics developed by the SRWMD and other sister districts. In addition, recent technical reviews of the field can help define the contents of the toolbox.
- Analysis by Graham et al. (2013) clearly show that sensitivity of flow and levels reductions can be quite different for WRV threshold metrics set using 15% change versus event metrics that include components of magnitude, duration and return interval (MDR). This strongly advocates for the reevaluated all the relevant WRV for both rivers, and their associated springs.

11. UF Peer Review Panel—Reviewer finds that major recommendations from 2013 peer review for MFLs that are now being re-evaluated (Graham et al. 2013) have not been fully followed. Key recommendations from the previous peer review (Graham et al. 2013) were not fully addressed in the previous peer review for the initial MFLs adopted in 2015. Furthermore, all of these remain problematic in this re-evaluation. Dr. Dunn's specific comment on this topic is G5. Graham et al. (2013) as yet not fully addressed significant concerns were:

- To prevent significant harm MFLs threshold metrics should include consideration of duration and return interval of both low flow and high flow events in addition to cumulative frequency. They state concerns with the use of flow duration curves (FDCs) alone to characterize the flow regime as they may not adequately relate important biological, or ecological responses to variations in the flow regime. Five critical components of flow regime are frequently recognized in the it when assessing environmental flows: 1) magnitude, 2) return interval 3), duration 4), timing, and 5) rate of change
- The Panel recommended that the 15% threshold of change be more fully justified as it applies specifically to the LSF and Ichetucknee Rivers. They found that justification for the proposed threshold of a 15% habitat loss in the establishment of MFLs is based on precedent and cannot be justified based on the data presented in the report. So, while there is a precedent for the adoption of the 15% threshold, its general applicability is unproven
- Panel found that quite different outcomes result from applying the % change method versus events with return intervals. Their Table 1 table is comparison of 15% allowable flow reductions by WRV for LSFR range from 5-8 percent but change in return interval

for WRV events range from 14 to 29 percent, for the IR the numbers are 3-12%, versus 27-45%.

- In the face of uncertainties caused by absence of key supporting data, the panel urged the District to adopt an adaptive management (AM) approach allowing decisions based on limited data to be reinforced or modified as new research and monitoring information become available
12. **Seasonality**—Reviewer finds that report needs to address seasonality issues when they are relevant to defining WRVs and setting their metrics. How seasonality is handled should be stated in the approach for defining WRVs. Seasonality typically adds components of seasonal occurrence and duration of that seasonal window. So, using an event-based metric seems both prudent, and a scientifically defensible choice. Also, if this were being done by the SJRWMD, then the event would be defined. I am sure that SJR District has many examples from established MFLs. Dr. Dunn’s specific comments on this topic are: G11, 3.18, 5.9, and 5.10.
 13. **Water Quality Nexus to Flow Regime** –Reviewer notes that there are clearly identified water quality impairments of concerns in these rivers and springs. These key water quality issues remain largely divorced from consideration in this MFL. Several recent research findings indicate however, that some water quality problems do have link with flow regimes. As WRV metrics will now be assessed anew we may have the opportunity to incorporate meaningful water quality thresholds in one or more WRV metrics. Dr. Dunn’s specific comments on this topic are: G14, 5.30, and 7.6.
 14. **Climate Change is Upon Us**—Reviewer asks about impact of climate change. Climate change is not addressed in the document. MFLs are by their nature our estimates of sustainable resource management. If we are indeed in a time of climate change, then the assumptions upon which we base MFL type sustainability may not hold in the future. In statistical hydrology this is a question of stationarity of the statistical populations comprising our climate driven time series data for temperature, rainfall, runoff, aquifer recharge, etc. The consensus of climate experts is that key time series are in flux, that is they are statistically non-stationary. Climate change is another element of uncertainty, it needs to be discussed, and likely impacts identified and planned for. Dr. Dunn’s specific comment on this topic is G16.
 15. **Update Science on Environmental Flows** –Reviewer that the process and methods used to match WRVs to proper indicators and metrics must be better matched with the current state of state of the science of environmental flows. Thus, the authors need to update their literature review, and science for methods used to set minimum flows and levels, specifically the WRV metrics. A very good, very detailed review of the state of science and practices is a recent book *Water For The Environment* (Horne et al. editors, 2017) provides in depth reviews of current status of theory practice, research and application. This book’s citation is: *Water for the Environment: From Policy and Science to Implementation and Management*, Edited by Avril C. Horne, J. Angus Webb, Michael J. Stewardson, Brian Richter and Mike Acreman. Academic Press, 2017, 720 pages. Dr. Dunn’s specific comments on this topic are: G8 and G18.
 16. **Managing Uncertainty**—Reviewer notes that HSW’s report lacks an integrated treatment of the sources of uncertainty. This leaves a reviewer unable to determine the significance of impact of uncertainties. And lacking an inventory and sensitivity assessment of sources, then there is not a plan to manage uncertainty effectively, such that its negative effects can be reduced, or eliminated. Uncertainty issues are discussed throughout the report, and are key to many of key decisions made for choosing methods of analysis, time series data, etc. Management of uncertainty moving forward is not highlighted, and it should be. Dr. Dunn’s specific comments on this topic are: G10, 4.3, and 6.13. Sources of uncertainty in this MFL setting process include:
 - Groundwater and surface water modeling

- Surface water modeling
- Water budget develop, including hydrologic time series needed
- Reference flow developed for assess impacts of historic consumptive use
- Selection of relevant WRVs, and subsequent parameterization of the assessment's metrics
- Water quality Impairments affected by flow or level
- Effects of climate change

17. **Applying Adaptive Management (AM)**—reviewer notes that the report lacks an explicit adaptive management (AM) framework. He recommends that AM approach be applied to this MFL setting effort and used as a guiding principle. This is a repeat of a major recommendation by UF's peer review panel's finding and recommendations from seven years ago (Graham et al. 2013). Dr. Dunn's specific comments on this topic are G9 and G15.

This constitutes the Chair's synthesis of the peer review panel's findings and recommendations. This report identifies an array of seventeen issues of significance that can directly and materially affect the proposed MFLs. Two reviewers did not find critical fault with the proposed MFLs. The Chair did however, calling for a step back to the WRV parameterization process. This is a call for a redo. The redo can proceed quickly once the WRV re-parameterization is done.

WHAT'S NEXT?

This summary once submitted and accepted by the District will be made available to public, as the individual reviews have already. The ongoing peer review process will include two public meetings. The public meetings will serve: 1) to present these findings and recommendations, 2) allow the three panel members to discuss findings and recommendations, and 3) to take public comment. Following the first public meeting, the Chair will refine the panel's findings and recommendations, as needed and will produce his second summary report. Following a public review period, a second public meeting of the panel will take place following the same format as the first meeting. The outcome of the second public meeting will be the Chair's final report.

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13—Physical Habitat Modeling and Ecohydrological Tools by Lamoureux, N., C.H. Hauer, M.J. Stewardson, and N.L. Poff.

14—Models of Ecological Responses to Flow Regime Change to Inform Environmental Flows Assessments by Webb, J.A., A.H. Arthington, and J.D. Olden.

15—Uncertainty and Environmental Water by Lowe, L., J. Szemis, and J.A. Webb

16 Water Budgets to Inform Sustainable Water Management by Richter, B. and S. Orr

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