August 27, 2012

Jan Mandrup-Poulsen, Administrator
Watershed Evaluation Section
Florida Department of Environmental Protection
3900 Commonwealth Blvd., M.S. 10
Tallahassee, FL 32399

RE: Public Comment on the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4, published on July 6, 2012. http://www.dep.state.fl.us/water/tmdl/merctmdl.htm

Dear Mr. Mandrup-Poulsen:

This is set of formal public comments from Waterwise Consulting, LLC, on the Revised Draft Mercury Total Maximum Daily Load for the State of Florida Report to USEPA Region 4: http://www.dep.state.fl.us/water/tmdl/merctmdl.htm, which was published on July 6, 2012, and the scientific, administrative, and legal deficiencies in the statewide approach to the restoration and protection of mercury-impaired Florida waters that was adopted by the State of Florida for the purpose of developing and implementing a mercury Total Maximum Daily Load (TMDL) pursuant to Clean Water Act (CWA) Section 303(d)(1)(C) and the point source Waste Load Allocation (WLA) and Water Quality-Based Effluent Limitations (WQBELs) deriving therefrom to restore and protect mercury-impaired Florida waters. As a consequence of these serious deficiencies, the U.S. Environmental Protection Agency (USEPA) Region 4 cannot approve this statewide mercury TMDL, WLA, or WQBELs, and USEPA Region 4 as is and will have abused its discretion by doing so.

Please acknowledge the timely submittal of these formal public comment regarding the need to correct these serious deficiencies and make the required substantial revisions to this Revised Draft Report and any subsequent formal administrative actions deriving therefrom. I reserve the right to amend and extend my formal public comments on this administrative action in response to information obtained via one or more of the outstanding formal public records requests that have not yet been fulfilled in a reasonable period of time. Hereinafter the Revised Draft Mercury Total Maximum Daily Load for the State of Florida is also referred to as the Revised Draft Hg TMDL Report, the Hg TMDL Report, the Hg Report, or the Report.

Exhibit A incorporates by link the Federal Clean Water Act and contains the excerpt of its TMDL provision, Section 303(d)(1)(C). Exhibit B incorporates the internet links to the regulations and technical guidance promulgated and published to implement CWA Section 303(d)(1)(C) and the related Glossary of Terms. Exhibit C incorporates the link to the USEPA WQC Document for Methylmercury to Protect Human Health that USEPA published in January 2001. Exhibit D contains the link to guidance for implementing the revised mercury WQC for methylmercury in fish flesh. Exhibit E is the link to reference and technical guidance for the use of USEPA-approved analytical methods in general and USEPA Methods 1630 and 1631 for ultra-trace MeHg and THg analysis, respectively, in water, sediment, and fish. Exhibit F is the link to the Revised Draft Report that is the subject of this formal public comment, Exhibit G are the References contained therein, and Exhibit H is the link to Appendix H to the Revised Draft Report containing the water, sediment, and sport fish data collected by or for FDEP in the one-tine, statewide mercury monitoring campaign in the period 2008-2010. Exhibit I is the link to Florida's impaired waters statute and rules and relevant excerpts from the rule.

This is also a formal request that FDEP demonstrate that the State of Florida's statewide mercury development and implementation approach, assumptions, approximations, extrapolations, interpolations, methods, procedures, quality assurance and control criteria and failure rates, record-making, record-

keeping, auditing, peer review, and recusal comport with all applicable Federal and State statutes, regulations, rules, technical guidance, required accreditations and certifications, accepted professional standards of technical and ethical practice, and common sense regarding the development and implementation of an enforceable TMDL for an impaired waterbody in general and mercury-impaired waterbodies in particular, including but not limited to the use of USEPA-approved or recommended analytical methods in monitoring, water quality modeling, TMDL calculation, and/or the waste load allocations and water quality-based effluent limitations deriving therefrom.

Executive Summary

(1) The Contamination of the Human Food Supply with Toxic Amounts of Toxic Methylmercury Constitutes an Imminent and Growing Threat to the Public Health, Safety and Welfare and a Violation of the State of Florida's Narrative "No Toxic Substances in Toxic Amounts" Water Quality Standard for the Protection of Human Uses of Fishable and Swimmable Waters

The contamination of the human food supply with toxic amounts of toxic methylmercury constitutes an imminent and growing threat to the public health, safety and welfare and a violation of the State of Florida's Narrative "No Toxic Substances in Toxic Amounts" Water Quality Standard (WQS) for the protection of human uses of fishable and swimmable waters. There is an unacceptable risks of cognitive impairment to the developing fetus in the third trimester from the exposure of pregnant women to toxic methylmercury in toxic amounts when fish are consumed by pregnant women at Florida average rates, let alone subsistence rates, from most Florida lagoons, estuaries, and bays and many of Florida's lakes and rivers. According to FDEP's calculations, the median backrgound methylmercury dose rate from the consumption of salt water fish and shellfish species for Florida women of child-bearing age exceeds USEPA's methylmercury reference dose for the protection of the developing fetus of 0.0001 mg/Kg-day. If the Florida mercury WQS were calculated in the same way as the USEPA WQC, the allowable concentration in freshwater fish is < 0. In fact the background concentrations in salt water fish and shellfish species in Florida would have to be reduced by 24.3% just so that the median exposure to methylmercury in Florida women of childbearing age equals USEPA's reference dose. Based on the results contained in Appendix H of the Hg TMDL Report, the flesh of largemouth bass collected from 72 (29%) of the 249 of the lakes and streams sampled out of the thousands that are mercury-impaired averaged twice the water quality target of 0.3 ppm total mercury as methylmercury in fish flesh on a wet-eight basis and 26 (10%) of 249 averaged three times that target. Many coastal waters average four and five times the mercury water quality target for prized, large-bodied, long-lived, top-predator sport fish species.

(2) There Is No Margin of Safety for Florida Women of Child-Bearing Age, the Developing Fetus, or the Nursing Infant

Because the half-life of methylmercury in a woman's blood stream is about 50 days, a pregnant woman and her fetus approach steady state with the average concentration of methylmercury in her diet by the beginning of her third trimester, so consuming the flesh from a typical largemouh bass from roughly one-third of the lakes and streams during her pregnancy at the state average rate of 21 grams per day (about an ounce and a quarter) doubles the risk of impairing the brain function of her developing fetus and in 10% of the lakes and streams that risk is tripled. It then takes roughly five half-lives to clear the excessively high methylmercury levels from her system once she stops eating that fish. Sadly, the clearance rate from a woman's body is measurably faster for nursing women, because they are dumping methylmercury into their breast milk, continuing the exposure of the nursing infant to methylmercury that began in the womb. Thereafter, it doesn't matter whether this woman of child-bearing age ever consumes another fish, because the neurological damage has already been done That being the case, FDEP's conceptual model of exposure of women of child-bearing age and their fetuses to methylmercury is flawed, because it

assumes that the exposures from the consumption of fish with high and low methylmercury concentrations average out over a woman's child-bearing years, thus justifying the use of average values rather than the actual concentration probability distribution function for each salt water fish and shellfish species consumed by Florida women of childbearing age in the probabilistic analysis used to calculate the median background methylmercury dose rate and the margin of safety in the water quality target. This may be true of a hypothetical statistic, but nor for real women playing toxic roulette with their unborn child. The risks of cognitive deficit in the developing fetus are magnified for women of child-bearing age who subsist on fish from a local canal, pond, lake, stream, estuary, or bay, because they consume fish at rates typically 5 times the Florida average rate. For them, there is no margin of safety in the 0.3 ppm water quality target. Whether this inequity constitutes a form of discrimination that violates the environmental justice provisions of applicable Federal law or Presidential Executive Order will be left to the judgment of the Federal courts.

(3) Informational and Educational Efforts are Necessary But Not Sufficient to Protect the Public Health, Safety, and Welfare

Informational and educational efforts by the Florida Department of Public Health, the Florida Department of Environmental Protection, and the Florida Fish and Wildlife Conservation Commission to limit exposure to methylmercury in toxic amounts by asking the public to self-limit the consumption of excessively contaminated fresh and salt water sport and commercial fish and shellfish originating from Florida waters have been less than fully effective in preventing human methylmercury toxicosis. This is evidenced by the number of cases of physician-reported neurotoxic effects in patients observed in the period 2001-2010. This is documented in the revised draft Hg TMDL Report. The decision by the DOH Secretary, in his capacity as Florida's Chief Medical Officer, to tighten the reporting criteria will reset the reporting baseline, but the number of cases meeting those tighter criteria will continue to rise as more and more people are driven to subsist on fresh and canned sport and commercial fish from Florida's fresh and salt waters. Whether this decision was made in good faith in the best interests of the public health, safety, and welfare or to undermine the epidemiological necessity for mercury regulatory action at this time will be left to judgment of the Florida courts.

(4) Threatened and Endangered Species are Not Adequately Protected by USEPA's Water Quality Criterion to Protect Human Health

Threatened and endangered fish-eating wildlife and their predators cannot read or heed the real or virtual warnings and avoid exposure to toxic amounts of methylmercury in their contaminated forage, so there has been, is, and will be an unacceptable risk of compromised reproductive success from which threatened and endangered species are explicitly protected under the Federal Endangered Species Act and for which there are potentially serious legal consequences, even if there are none for endangering humans. Those unacceptable risks are also documented in Section 2.4 and Appendix E of Hg TMDL Report, as well as data, reports, and publications in the possession of FDEP or to which it has ready access in the scientific, regulatory, or consultant literature. However, FDEP failed to calculate wildlife protection WQC following USEPA technical guidance but using the fish data collected in the one-time, statewide mercury monitoring campaign. When that is done, the unenforceable 0.3 ppm THg as methylmercury in a representative top-predator sport fish species, the largemouth bass, cannot be demonstarted to be adequately protective of representative fish-eating mammals, such as the otter and mink, or fish-eating avians, such as the eagle and osprey.

(5) FDEP has Failed to Timely Promulgate a Revised Class III Numerical Mercury WQS Adequately Protective of Human Health and Fish and Shellfish-Eating Wildlife and Their Predators

FDEP has been on public record that the existing duly promulgated numerical Class III WQS for mercury of 12 ng/L total mercury (THg) was not adequately of protective of the public health since the agency assumed responsibility for authoring or co-authoring the mercury chapter of the annual report to the Governor, the Legislature, and the Secretary of the Department of Environmental Protection on the status and trends of Everglades restoration, recovery, and permit compliance, now known as the South Florida Environmental Report (SFER). FDEP has known that Florida's existing mercury WQS was not adequately protective of human health since January 2001, when the USEPA WQC document was published. In the last triennial review cycle, FDEP proposed a revised mercury WQS of 0.2 ppm THg as methylmercury in fish flesh on a wet-weight basis to protect human health to reflect the higher average fish consumption rate and background methylmercury dose rate than the national averages used by USEPA to derive the 0.3 ppm value. That effort was subsequently abandoned without adequate notice or justification.

(6) Florida State Agencies Were Arbitrary, Capricious, and Abused Their Discretion in Assigning a Low Priority to the Development of Enforceable TMDLs for Mercury-Impaired Fresh and Salt Waterbodies in Florida for a Toxic Substance Present in Toxic Amounts in the Human Food Supply

FDEP's only formal administrative action to date regarding mercury was for the Environmental Regulation Commission to adopt at FDEP's request a revised impaired waters rule in December 2006 to designate mercury-impaired waters as a low priority because of the current lack of understanding of the mercury cycle in the environment. The Legislature's only contribution in this regard was to exempt the listings, priorities, and schedules for TMDL development and implementation from public challenge as a matter of Florida law.

(7) FDEP Has Not Proposed to Promulgate a Revised Mercury WQS in this Triennial Review Cycle or Committed to a Plan and Schedule for Same in 2012

On April 27, 2012, Florida Department of Environmental Protection (FDEP) public noticed its intent to conduct a limited Clean Water Act-mandated triennial review of its duly promulgated Water Quality Standards to protect the various uses of its fresh and salt waters. This limited review did not include mercury. https://www.flrules.org/gateway/ruleno.asp?id=62-302.530 This occurred about the same time that FDEP was preparing to release for public comment a Draft Statewide Mercury Total Maximum Daily Load (TMDL) Report to USEPA Region 4 on the extent, significance, status and trends, and proposed mercury load reduction strategy to restore mercury-impaired state waters, which, among other things, found that fishable uses were impaired even in waters where the existing THg WQS was nowhere being violated based on the one-time statewide mercury monitoring campaign of lakes and streams but not wetlands or salt waters. This decision was made despite being under a Federal Court Consent Decree to develop and implement enforceable TMDLs for all impaired waters listed pursuant to CWA Section 303(d) by September 30, 2012, including mercury-impaired waters. Instead of revising the deficient existing Class III numerical mercury WQS, Florida is proposing to adopt general technical guidelines for the derivation of WQS for the protection of human health using the same probabilistic approach adopted http://www.dep.state.fl.us/water/wqssp/docs/tr_review/human_health_073112.pdf; http://www.dep.state.fl.us/water/wqssp/docs/tr_review/hhc_tsd_071112.pdf in the Hg TMDL Report. The failure of FDEP to petition the ERC to revise the numerical Class III mercury WQS during this triennial review cycle will be the subject of inquiry before the Federal court.

(8) FDEP's Proposed Statewide Mercury Total Maximum Daily Load (TMDL) and the Waste Load Allocations (WLAs) and Water Quality-Based Effluent Limitations Deriving Therefrom are Scientifically, Administratively, and Legally Deficient.

There are serious scientific, administrative, and legal deficiencies in the design, methods, implementation, and interpretation of the results of the one-time, statewide mercury monitoring campaign, the calculation of the water quality target, the calculation of the load allocation, the consideration of the seasonal variation and the margin of safety in the calculation of the proposed load reduction required to attain and maintain the unenforceable water quality target in the absence of a duly-promulgated, enforceable revised Class III numerical Water Quality Standard for mercury, and the fair and equitable distribution of the mercury assimilative capacities between states, fresh and salt waters, point and nonpoint sources, and amongst point sources. The statewide approach to mercury TMDL development and implementation also, in effect, adopts a policy whereby not all mercury-impaired waters need be restored to unimpaired status. CWA Section 303(d)(1)(C) requires a waterbody-specific approach to TMDL development, and it makes no allowance for a statistical approach where 1%, 5%, or 10% of the state's mercury-impaired waters can be sacrificed as an administrative expedient. I refer to this as the "No Waterbody Left Behind" letter and spirit of CWA Section 303(d)(1)(C). Nor does the statewide approach even commit to follow-up monitoring of the sacrificed waters to evaluate their responses to the mercury load reduction intended to restore most but not all of Florida's mercury-impaired waters. To the contrary, state law requires that all mercury-impaired waters be delisted as soon as the statewide mercury TMDL is published. These are fatal flaws in the development and implementation of the statewide approach to the Florida mercury TMDL that must be corrected prior to submittal of the Revised Draft Hg TMDL Report to USEPA Region 4 for review and comment. If these fatal flaws are not corrected prior to submittal, USEPA Region 4 cannot approve this statewide mercury TMDL, and USEPA Region 4 will have abused its discretion by doing so.

(9) The Implicit Combined Margin of Safety Claimed by FDEP for Its Proposed Approach to Statewide Mercury TMDL Development and Implementation is Not Adequate to Compensate for the Propagated Errors and Compounded Uncertainties in the Proposed Statewide Mercury TMDL, WLAs, and WQBELs Deriving Therefrom

FDEP has adopted an implicit margin of safety to compensate for any lack of knowledge about the relationship between the mercury loading rate and the methylmercury bioaccumulating in the reference freshwater sport fish species, the largemouth bass. However, the implicit margin of safety is in the assumptions used to derive and apply the water quality target, not the load-concentration relationship. This is the same approach recommended by Florida's Allocation Technical Advisory Committee. This approach is contrary to relevant technical guidelines for implementing Section 303(d)(1)(C). USEPA Region 4 erred in the past by approving TMDLs based on this approach to the implicit margin of safety. This fatal administrative deficiency withstanding, the implicit margin of safety in the derivation of the unenforceable water quality target and the state's approach to its implementation is not adequate to compensate for the uncertainties in the mercury load-concentration relationship to protect the average Florida consumer of sport fish, let alone a subsistence consumer protected by the Environmental Justice provisions of applicable Federal statutes, regulations, and Presidential Executive Orders. This deficiency is further magnified by the adoption of a statewide approach to mercury TMDL development and implementation because of the greater variation in the reference sport fish THg concentrations between waterbodies sampled in the same season than within the same waterbodies sampled in different seasons. As a consequence of the inadequacy of the implicit margin of safety in the statewide mercury TMDL, there is an unacceptable probability of concluding that the fishable uses of a mercury-impaired waterbody will have been restored by the proposed 90% reduction in controllable point and nonpouint sources of mercury when it has not at the 95th percentile confidence level.

(10) As a Consequence of (9), There is an Unacceptable Likelihood of FDEP Concluding that It Has Reasonable Assurance that the Mercury-Impaired Waterbodies Will Recover and Attain Mercury-Unimpaired Status when They Will Not

Due to the seasonal variation that was ignored in the design of the one-time, statewide mercury monitoring campaign and the analysis, integration, and synthesis of its results, there is a statistically significant probability that a resource manager will incorrectly conclude from the results of the study that a waterbody is not mercury-impaired when it is or that it has recovered from that mercury impairment as consequence of the proposed mercury atmospheric load reduction when it has not. The use of age, size-, or weight-standardized transformations of the fish data is unlikely to reduce the rate of committing such a critical error in judgment to acceptable levels. The unacceptable probability of committing such resource management decision-making errors is a consequence of the flawed study design that followed from the faulty assumption that seasonal variation could be ignored as an administrative expedient. The validity of that assumption is contradicted by the study results for a subset of lakes that were resampled in a different season. This negates the value of the study results and the mercury resource management and point source regulation decisions deriving therefrom. The margin of safety in the compounded assumptions adopted by FDEP to develop and implement the statewide mercury TMDL approach is inadequate to compensate for the tendency of resource managers to draw incorrect conclusions of such critical consequence from the study results.

(11) As a Consequence of (10), There Is an Unacceptable Likelihood that FDEP Will Prematurely and Incorrectly Delist Mercury-Impaired Waters Merely Because FDEP Has Published a Statewide Mercury TMDL

CWA Section 303(d)(1)(C) requires a waterbody-specific approach to TMDL development and implementation to ensure that the waterbody attains its duly promulgated WQS. No mercury-impaired waterbody shall be left behind in the process of developing or implementing a statewide mercury TMDL as an administrative expedient. And no mercury-impaired waterbody shall be delisted until all of its statewide and watershed-specific mercury source controls and best management practices have been implemented, the waterbody has had sufficient time to respond to the mercury load reduction, and follow-up monitoring demonstrates the long-term attainment and maintenance of mercury-unimpaired status. If state law requires otherwise, then the state law must be changed to comport with Federal law.

(12) USEPA Region 4 Will Have Abused Its Discretion If It Approves The State of Florida's Scientifically, Administratively, and Legally Deficient Statewide Mercury TMDL and the WLAs and WQBELs Deriving Therefrom

Florida's statewide approach to mercury TMDL development is contrary to CWA Section 303(d)(1)C) and the regulations and technical guidelines promulgated and published to implement that provision. It is based on restoring mercury-impaired waters to an unenforceable water quality target rather than a duly promulgated, revised Class III numerical mercury WQS. The unenforceable target is demonstrably inadequately protective of the median Florida woman of child-bearing age consuming salt water fish and shellfish species with median concentrations of total mercury as methylmercury, including fish and shellfish originating from Florida waters, at median consumption rates, let alone a subsistence consumer protected by treaty or the environmental justice provisions of applicable Federal law or Presidential Executive Order. The approach adopted by the state assumes without proof that restoring its lakes and streams will restore its wetlands, when some wetlands can be demonstrated to be more mercury-susceptible than lakes and streams, as evidenced by the Everglades. It also assumes that restoring Florida's fresh waters will restore its salt waters, when many lagoons, estuaries, and bays have higher methylmercury concentrations in their flesh than the fresh waters flowing into them under the same

mercury atmospheric deposition loads, as evidenced by the Lake Okeechobee-Everglades-Florida Bay system.

Florida then calculates the required mercury load reduction to restore the unimpaired status of all fresh waters up to the 90th percentile level of methylmercury contamination. In effect this sacrifices 10% of Florida's most mercury-susceptible, mercury-impaired waters as an administrative expedient. Section 303(d)(1)(C) makes no such provisions. No waterbody shall be left behind using the statewide approach to mercury TMDL development and implementation. In particular, because the results of the one-time, statewide mercury monitoring of a subset of lakes and streams demonstrates that streams are more mercury-susceptible than lakes, so roughly 15% of the streams are being sacrificed using this approach. The margin of safety with seasonal variation is insufficient to ensure that even these statistical targets will be hit. Nevertheless, when a corrected 90th percentile Florida stream LMB THg as MeHg concentration is adopted, the required load reduction from all air emissions sources is 99%, not 86%.

The incorrectly calculated mercury TMDL was then not fairly and equitably distributed between states for inter-state fresh and salt waterbodies and then between and among controllable in-state point and nonpoint sources. The WQBELs were not correctly calculated for mercury over-allocated Florida waters where the TMDL - LA - M.O.S. < 0. The mercury over-allocated waters require zero discharge of mercury. For point sources regulated under CWA Section 402, this translates into no detectable discharge of THg at the method detection limit of the duly promulgated, USEPA-approved method for ultra-trace mercury analysis, Method 1631, not the enforceable but deficient existing mercury WQS of 12 ng/L, the unenforceable water quality target of 1.25 ng/L, or any variation on that theme.

As a consequence of these errors of omission and commission, Florida's statewide mercury TMDL is so seriously scientifically, administratively, and legally deficient that it must be considered fatally flawed, and USEPA Region 4 will have abused its discretion by approving it. Instead, Florida's Hg TMDL Report must be substantially revised to correct these errors to comport with letter and spirit of CWA Section 303(d)(1)(C) and the regulations and technical guidelines promulgated and published by USEPA to implement that provision.

Introduction

The contamination of the human food supply with toxic amounts of toxic methylmercury constitutes an imminent and growing threat to the public health, safety and welfare and a violation of the State of Florida's narrative "no toxic substances in toxic amounts" Water Quality Standard for the protection of human uses of fishable and swimmable waters. There is an unacceptable risks of cognitive impairment to the developing fetus in the third trimester from the exposure of pregnant women to toxic methylmercury in toxic amounts when fish are consumed at Florida average rates, let alone subsistence rates, from most Florida lagoons, estuaries, and bays and many of Florida's lakes and rivers. According to FDEP's calculations, the median backrgound methylmercury dose rate from the consumption of salt water fish and shellfish species for Florida women of child-bearing age exceeds USEPA's methylmercury reference dose for the protection of the developing fetus of 0.0001 mg/Kg-day. If the Florida mercury WQS were calculated in the same way as the USEPA WQC, the allowable concentration in freshwater fish is < 0. In fact, the background concentrations in salt water fish and shellfish species in Florida would have to be reduced by 24.3% just so that the median exposure to methylmercury in Florida women of childbearing age equals USEPA's reference dose. Based on the results contained in Appendix H of the Hg TMDL Report, the flesh of largemouth bass collected from 72 (29%) of the 249 of the lakes and streams sampled out of the thousands that are mercury-impaired averaged twice the water quality target of 0.3 ppm total mercury as methylmercury in fish flesh on a wet-eight basis and 26 (10%) of 249 averaged three times that target. Many coastal waters average four and five times the mercury water quality target for prized, large-bodied, long-lived, top-predator sport fish species.

Because the half-life of methylmercury in a woman's blood stream is about 50 days, a pregnant woman and her fetus come to a steady state with the average concentration of methylmercury in her diet by the beginning of her third trimester, so consuming the flesh from a typical largemouh bass from roughly one-third of the lakes and streams during her pregnancy at the state average rate of 22 grams per day (about an ounce and a quarter) doubles the risk of impairing the brain function of her developing fetus and in 10% of the lakes and streams that risk is tripled. It then takes roughly five half-lives to clear the excessively high methylmercury levels from her system once she stops eating that fish. Sadly, the clearance rate from a woman's body is measurably faster for nursing women, because they are dumping methylmercury into their breast milk, continuing the exposure of the nursing infant to methylmercury that began in the womb. Thereafter, it doesn't matter whether this woman of child-bearing age ever consumes another fish, because the neurological damage has already been done That being the case, FDEP's conceptual model of exposure of women of child-bearing age and their fetuses to methylmercury is flawed, because it assumes that the exposures from the consumption of fish with high and low methylmercury concentrations average out over a woman's child-bearing years, thus justifying the use of average values rather than the actual concentration probability distribution function for each salt water fish and shellfish species consumed by Florida women of childbearing age in the probabilistic analysis used to calculate the median background methylmercury dose rate and the margin of safety in the water quality target. This may be true of a hypothetical statistic, but nor for real women playing toxic roulette with their unborn child. The risks of cognitive deficit in the developing fetus are magnified for women of child-bearing age who subsist on fish from a local canal, pond, lake, stream, estuary, or bay, because they consume fish at rates typically 5 times the Florida average rate. For them, there is no margin of safety in the 0.3 ppm water quality target. Whether this inequity constitutes a form of discrimination that violates the environmental justice provisions of applicable Federal law or Presidential Executive Order will be left to the judgment of the Federal courts.

Efforts by the Florida Department of Public Health (FDOH), the Florida Department of Environmental Protection (FDEP), and the Florida Fish and Wildlife Conservation Commission (FFWCC) to inform and educate the public in general and women of child-bearing age in particular to reduce their risk of exposure to toxic methylmercury in toxic amounts by avoiding or limiting the consumption of fresh and salt water sport and commercial fish and shellfish have been less than fully effective in preventing human methylmercury toxicosis, as evidenced by the number physician-reported cases of methylmercury neurotoxic effects in the period 2001-2010. The policy switch from posting signs in the field to distributing brochures with fishing licenses and posting warnings on the DOH, DEP, and FFWCC Internet websites has diminished the effectiveness of this information and education campaign with the most exposed subpopulation of subsistence-level fishers. When surveyed and asked whether they were concerned about the mercury contamination of the fish they were catching and consuming, most subsistence fishers said they assumed if there were no signs, the fish were safe to eat. All of this is documented in the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4 (hereinafter the Hg TMDL Report).

In any case, threatened and endangered fish-eating wildlife and their predators cannot read or heed the real or virtual warnings and avoid exposure to toxic amounts of methylmercury in their contaminated forage, so there has been, is, and will be an unacceptable risk of compromised reproductive success from which threatened and endangered species are explicitly protected under the Federal Endangered Species Act and for which there are potentially serious legal consequences, even if there are none for endangering humans. Those unacceptable risks are also documented in Section 2.4and Appendix E of Hg TMDL Report, as well as data, reports, and publications in the possession of FDEP or to which it has ready access in the scientific, regulatory, or professional literature. The 0.3 ppm THg as methylmercury value is not adequately protective of all fish-eating wildlife-species, including threatened or endangered species such as the wood stork, the bald eagle, or the Everglades mink, or predators of fish-eating wildlife,

including the highly endangered Florida panther. Following the procedures used by USEPA in its Mercury Report to Congress (1997) but substituting Florida-specific Trophic Level 3 and 4 data in the statewide mercury monitoring campaign, the corresponding mammalian no adverse effect level (NOAEL) in fish is 0.17 ppm vs. 0.3 pppm to protect human health. If the mallard duck LOAEL is divided by 3 to approximate the NOAEL, as was done by Darren Rumbold, Ph.D., in SFWMD's STA-2 Methylmercury Anomaly Ecotoxicological Risk Assessment approved by FDEP in 2004, the bird WQC now controls at 0.08 ppm THg as methylmercury. http://www.tandfonline.com/doi/abs/10.1080/10807030590925768 A screening-level ecotoxicological risk assessment of the Florida panther indicates that a panther foraging at typical rates on Everglades-like juvenile alligator, otter, and raccoon, will be at an elevated risk of reproductive failure, and if a pregnant female shifts progressively to such prey species as her pregnancy progresses, the elevated risks may approach or exceed unacceptable levels, while the avian NOAEL-based WQC is likely to be protective of the reproductive success of the typical Florida panther female and will reduce the likelihood of reproductive failure of the atypical female.

The recent decision by the DOH Secretary, acting in his capacity as Chief Medical Officer for the State of Florida, to tighten the criteria for physician reporting of methylmercury neurotoxic effects will reset the reporting baseline, but the reporting incidence will still be on the rise relative to that new baseline, because more and more people are living near or below the poverty line as a consequence of the Great Recession and more and more people are being driven to subsistence consumption of fresh and canned salt and fresh water fish and shellfish contaminated with toxic methylmercury in toxic amounts when consumed at Florida average, let alone subsistence rates. Whether this decision was made in good faith in the best interests of the public health, safety, and welfare or an arbitrary and capricious abuse of discretion to undermine the epidemiological necessity for mercury regulatory action at this time will be left to the judgment of the Florida courts. The nutritional desperation of those near or in poverty is exacerbated by the foreshortening of the period during which the formerly employed can collect unemployment compensation and the tightening of criteria for state assistance with the costs of shelter, food, and medicine. Perhaps all people on welfare should be tested for the methylmercury residues in their hair in addition to the illegal recreational drug residues in their urine.

When then Secretary of the then Florida Department of Environmental Regulation, Carol Browner, was confronted with the choice of continuing to permit the construction and operation of new mercury emissions sources or of imposing a moratorium on the issuance of new source permits until more information was obtained about the effects of their mercury emissions, she erred on the side of protecting the public health, not profit, in the face of uncertainty, and imposed the moratorium. As a consequence, Florida became a world leader in the monitoring, research, and modeling of the mercury cycle in the environment. I was privileged to lead that multi-agency, multi-entity effort from 1996 to 2000, when the South Florida Water Management District, at the direction of its Governing Board, officially opted out of Florida's mercury research program, because the mercury was coming from the air, over which SFWMD had no authority or interest. This status persisted until it became obvious that an oxidized form of sulfur, sulfate, in stormwater runoff from the Everglades Agricultural Area was causing or contributing to the downstream Everglades mercury problem, at which point SFWMD opted back in to more effectively represent local interests in the design, implementation, interpretation, and application of the results of the relevant mercury research.

As a consequence of this noble mercury pedigree, no Federal, state, or local agency was, is, or will be more able or in a better position to regulate mercury emissions to protect the public health and endangered wildlife than FDEP. The Federal Court Consent decree was issued in 1999 in the matter of Florida Wildlife Federation et al.vs. (ironically) Carol Browner et al., and USEPA published its revised methylmercury Water Quality Criterion (WQC) in fish flesh to protect human health in January 2001. Since then, FDEP has failed to promulgate a revised mercury WQS as or more protective of human health than the USEPA WQC to replace the duly promulgated WQS of 12 ng/L total mercury in

unfiltered water, which FDEP has officially acknowledged is not adequately protective of humans exposed via fish and shellfish consumption since 2001. In the face of an imminent and growing threat to the public health, safety, and welfare, FDEP has done less than the absolute minimum required to fulfill its official responsibilities. Instead, since 2001, FDEP's only relevant formal administrative action regarding this imminent and growing threat to the public health, safety, and welfare is the promulgation of a December 2006 revision to the impaired waters rule via the Environmental Regulation Commission that designates mercury-impaired waters to be a low priority for mercury TMDL development, because of, parenthetically, the current lack of understanding about the cycling of mercury in the environment. The Florida Legislature compounded the problem by exempting this prioritization scheme from public challenge. It would appear that a well-lobbied fix is in to ensure that Florida lags rather than leads the nation in protecting the public health, safety, and welfare from the mercury threat.

FDEP has failed to promulgate in a timely manner a revised Class III numerical WQS to protect human health and fish-eating wildlife or their predators as or more protective than USEPA's methylmercury Water Quality Criterion (WQC) to protect human health that would replace the existing mercury WQS, despite being under a Federal Court Consent Decree to develop and implement enforceable TMDLs for all impaired waters listed pursuant to CWA Section 303(d) by September 30, 2012, including mercury-impaired waters. Florida's existing mercury WQS was not violated in any lake or stream sampled in the one-time mercury monitoring campaign that began in 2007 and was completed in 2010. FDEP has known that Florida's existing mercury WQS was deficient since January 2001, when the USEPA WQC document was published. In the last triennial review cycle, FDEP proposed a revised mercury WQS of 0.2 ppm THg as methylmercury in fish flesh on a wet-weight basis to protect human health to reflect the higher average fish consumption rate and background methylmercury dose rate than the national averages used by USEPA to derive the 0.3 ppm value. That effort was subsequently abandoned without adequate notice or justification. Why a water quality target of 0.3 ppm THg is now considered adequately protective of human health when the more Florida-appropriate 0.2 ppm THg had been proposed for promulgation in the previous triennial review cycle will be the subject of inquiry before the Federal court.

Having abandoned its effort to promulgate a revised mercury WQS, FDEP's only formal administrative action to date regarding mercury was for the Environmental Regulation Commission to adopt a revised impaired waters rule in December 2006 to designate mercury-impaired waters as a low priority because of the current lack of understanding of the mercury cycle in the environment. The Legislature's only contribution in this regard was to exempt the listings, priorities, and schedules from public challenge as a matter of Florida law. Nothing in the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4 commits the State of Florida to the adoption of duly promulgated revised mercury WQS adequately protective of human health and threatened or endangered fish-eating wildlife and a set of duly promulgated mercury TMDLs to attain and maintain the duly promulgated revised mercury WQS or even a plan and schedule for their promulgation.

Ultimately, it will be up to the State Courts to determine whether the failure of past and present responsible Florida officials to act with due diligence in a good-faith effort to protect the health, safety, and welfare of all the people of the State of Florida rises to the level of gross negligence and dereliction of duty for which legal sanctions are both appropriate and necessary. If the courts so rule, this will send a message to future occupants of these high offices that Federal, Florida, and local agencies have a responsibility to protect people over profit. People and the resources held in public trust upon which they depend are not expendable as an administrative expedient. Concurrently, it will be up to the Federal Courts to determine whether USEPA Region 4 again abused its discretion in failing to carry out its responsibilities and exercise its authorities to promulgate a revised mercury WQS as or more protective than USEPA's WQC and a mercury TMDL for all mercury-impaired Florida waters when Florida failed to do so in a timely manner, as required by statute, regulation, and court precedent in the matter of Scott vs. the City of Hammond et al.

I also had the privilege of participating in the implementation of Scott vs. City of Hammond et al. while working for USEPA's Great Lakes National Program Office and with USEPA Region 5 in Chicago, so I am well-versed in what constitute valid technical limitations to TMDL development and implementation based on the current lack of understanding about the sources and cycling of toxic substances in aquatic ecosystems and the plans and schedules required to remove those technical barriers under a Federal Court Order. If USEPA Region 4 approves this scientifically, administratively, and legally deficient mercury TMDL for the State of Florida as captured in the Hg TMDL Report, it will have abused its discretion and become complicit in Florida's flouting of the Federal Consent Decree for which Federal Court sanctions are appropriate and necessary.

Background

According to the language of CWA Section 303(d)(1)(C) and the USEPA regulations and technical guidance promulgated and published to implement that provision, a Total Maximum Daily Load (TMDL) is calculated to attain and maintain the water quality standard, not an unenforceable target, taking into account seasonal variation in water quality and with an adequate margin of safety to compensate for any lack of knowledge about the relationship between the pollutant loading rate and the pollutant concentration in the receiving water under those seasonally appropriate infrequent conditions. The TMDL is then reduced by the required adequate margin of safety and then further reduced by the uncontrollable background sources, both natural and anthropogenic, including contributions from atmospheric deposition and groundwater recharge, and uncontrollable anthropogenic nonpoint sources, including unremediable soils and groundwater in the watershed and sediments in the water body, and man-induced irretrievable conditions, e.g., from abandoned mine drainage. This is the load allocation (LA). What remains is distributed fairly and equitably between and then among controllable nonpoint sources and all point sources. This is the Waste Load Allocation (WLA). The WLA formula used by both USEPA and FDEP is: WLA = TMDL - MOS - LA. If the LA is > TMDL - MOS, there is nothing left to allocate to controllable point and nonpoint sources, and the default water quality-based effluent limitation is non-detectable THg using USEPA-approved method 1631, not the water quality target. No delegated state has the authority to reduce the emissions of any pollutant from any air source or source category regulated under the Clean Air Act and cannot invoke the prospect of same to reduce the LA to increase the WLA. However, while a state's mercury reduction strategy may make reference to the reductions expected from the eventual implementation of new technology-based and/or air quality-based air emissions regulations, one can only subtract from the LA the actual reduction in their contributions to the LA only after those new CAA regulations take effect and the reductions are achieved that benefit a state's fresh and/or salt waters.

FDEP's Proposed Statewide Mercury TMDL and the WLA Deriving Therefrom are Scientifically, Administratively, and Legally Deficient

Critical Waterbody Categories and Potential Limiting Waterbodies Have Been Omitted from Florida's Statewide Mercury TMDL

The proposed statewide approach to the development and implementation of the mercury TMDL for in-land fresh waters omits wetlands, no doubt because they are depauperate in large-bodied Trophic Level 3 and 4 sport fish species, except when rising stages reconnect the wetland with a permanent lake or stream. However, wetlands may have also been omitted because their surface area-to-volume ratios and flushing times, perimeter oxidation-reduction cycles, and sedimentation rates are inherently seasonal, as are the food webs that bioaccumulate the excess methylmercury generated in seasonal pulses following reinundation of oxidized soils, so there would be neither a scientific basis for ignoring seasonal variation, as was the case in lakes and streams, nor for assuming that the waterbody has reached a steady-state

condition relative to its long-term average mercury loading rate. Nevertheless, waterbodies in watersheds with upland wetlands tend to have higher methylmercury concentrations than waterbodies that don't, suggesting that the seasonality of wetlands and the seasonality of the lakes and streams under their runoff influence cannot be completely deconvolved.

All in-land and coastal waters will benefit from a reduction in the contributions from all point and nonpoimt sources of mercury deposition to inland lakes and streams, but there is no guarantee that mercury-impaired salt waters will attain the water quality target, because the mercury load-methylmercury concentration relationships in freshwater lakes and streams and brackish and coastal marine waters are likely to be very different, and the methylmercury bioaccumulation potential for largemouth bass is not representative of the slow-growing, large-bodied, top-predator prized salt water sport fish. Some estuarine and coastal marine waterbodies are the limiting waterbody in the lake-stream-estuary series. See, for example, Lake Okeechobee-Everglades-Eastern Florida Bay. http://www.evergladeshub.com/lit/pdf11/Rumbold11estuarCoasts34-494-513-HgFLbayDeposition.pdf

The Water Quality Target Is Nor Adequately Protective of Human Health

The calculation of the TMDL is not based on a duly-promulgated, legally enforceable WQS but rather on an unenforceable water quality target based on USEPA's WQC of 0.3 ppm total mercury (THg) as methylmercury in fish flesh to protect human health, which FDEP recognizes is not adequately protective of the average Florida consumer, because it proposed a lower value of 0.2 ppm in the last triennial review cycle, let alone the subsistence consumer protected by the environmental justice provisions of Executive Order and Federal law. The probabilistic derivation of the daily average background methylmercury dose rate in ug/Kg bw-day uses the average concentrations of total mercury as methylmercury in each of a variety of salt water fish species consumed by Floridians, based on the assumption that exposure to fish methylmercury concentration extremes will be balanced over the course of the life of a woman of child-bearing age, but because the half-life of methylmercury in the human female is about 50 days, a pregnant woman comes to near steady state with the methylmercury in her diet by the third trimester, when the developing fetus is most susceptible to the neurotoxic effects of methylmercury, so one "hot" background fish consumed during her pregnancy can cause short-term, reversible cognitive deficit and perhaps long-term, irreversible cognitive deficit in the developing fetus in response to consuming that fish at the average Florida rate of 22 g/day, irrespective of what happens during the rest of her life, let alone at subsistence rates 5x the Florida average fish consumption rate.

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The Water Quality Target Is Not Adequately Protective of Fish- or Shellfish-Eating Wildlife or Their Predators

Even if the posting of mercury-impaired fresh and salt water lakes and streams were eventually determined by the courts to be considered adequate for the protection of the public health, safety, and welfare, the fish- and shellfish-eating wildlife held in trust by and for the citizens of Florida cannot read or heed the signs, both real and virtual. Section 2.4 on page 20 and Appendix E of the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4 discuss the methylmercury contamination status and trends and associated exposures and ecotoxicologically significant risks to fish-eating wildlife and their predators in general and migratory and endangered species in particular. However, nowhere is there a reference to an ecotoxicolological risk assessment conducted by or for the State of Florida demonstrating that the proposed 0.3 ppm water quality target to protect human health will also be adequately protective , of individual threatened or endangered species on the Florida and Federal Government lists at the 95th percentile confidence level. The fact that USEPA in general and Region 4 in

particular has approved TMDLs that take this approach does not mean that it comports with the requirements of the Federal Clean Water Act or the Federal Endangered Species Act. To the contrary, USEPA Region 4 has abused its discretion in approving such deficient waterbody-specific mercury TMDLs in other states and was derelict in its duty to promulgate a mercury TMDL for each state containing this fatal flaw. That should and will be the subject of subsequent litigation. In the alternative, Florida can revise the final draft Report to include the required trust species ecotoxicological findings, conclusions, and recommendations regarding the adequacy the 0.3 ppm target to protect the public trust in general and Florida and Federal wildlife trust species in particular.

FDEP now has in its possession or ready access to data, analyses, toxicodynamic/toxicokinetic (TDTK) models, ecotoxicological risk assessments, and reports demonstrating that the reproductive success of sentinel wildlife species will not be protected at a methylmercury concentration calculated by dividing the 0.3 ppm THg as MeHg water quality target by the 50th percentile (median) LMB BAF. This information includes the Great Lakes wildlife protection water quality criteria adopted by USEPA Region 5 for implementation of the Great Lakes Initiative published in the mid-1990s and the wildlife protection criteria derived by USEPA in its Mercury Report to Congress published in 1996 http://www.epa.gov/ttn/atw/112nmerc/volume6.pdf. The wildlife protection WQC in water was 48 pg/L as unfiltered methylmercury based on the protection of the mink and the otter, and the equivalent Trophic Level 3 (T3) and Trophic Level 4 (T4) fish concentrations based on national median T3 and T4 BAFs are 0.077 mg/Kg THg as MeHg and 0.325 mg/Kg THg as MeHg. Using the same exposure assumptions, but substituting the median T3 and T4 BAF values from the one-time Florida mercury monitoring campaign, the corresponding WQC for MeHg is 54 pg/L and the T3 and T4 BAFs are 0.093 and 0.17 mg/Kg THg as MeHg to protect representative fish-eating mammals, the otter and mink. If an inter-species adjustment factor of 1/3 is applied to the mallard duck NOAEL estimate, as was done by Darren Rumbold, Ph.D., in an ecotoxicological risk assessment accepted by FDEP for the STA-2 Cell 1 start-up MeHg anomaly http://www.tandfonline.com/doi/abs/10.1080/10807030590925768, the average bird value controls instead of the average mammal value at 0.026 ng/L MeHg in water, which translates into 0.047 and 0.082 mg/Kg THg as MeHg in Florida freshwater T3 and T4 fish, respectively. However, wildlife exposures are based on the consumption of whole fish, while the protection of human health is based on consumption of fish flesh. FDEP did not report and whole fish-to-fillet ratio for THg as MeHg in LMB or sunfish species, so a default vale of 0.69 is adopted here for purposes of illustration (Ted Lange, FFWCC, personal communication). After the whole-to-fillet correction is applied to the T3 and T4 fish, without a LOAEL-to-NOAEL correction, the Florida mammals still control, albeit at 0.13 and 0.25 THg as MeHg in fish flesh-equivalents for T3 and T4 fish, respectively. If the corrected mallard duck value is used, the birds control at 0.07 and 0.12 for T3 and T4 fish, respectively. That being the case, the human health water quality target of 0.3 ppm THg as MeHg in fish flesh is not protective of birds, including the threatened or endangered bald eagle or wood stork, or mammals, including the endangered Everglades mink.

Focusing on the Florida panther, it has been well-documented in the peer-reviewed scientific literature: http://www.ncbi.nlm.nih.gov/pubmed/15217246, the Federal and Florida environmental and wildlife protection agency literature: http://nature.nps.gov/air/Permits/aris/ever/studiesMonitoring.cfm; http://www.floridapanthernet.org/index.php and wildlife protection organization literature: http://www.panthersociety.org/mercury.html that exposure to methylmercury via foraging on methylmercury-contaminated prey foraging on methylmercury-contaminated aquatic life is a threat to the Florida panther subpopulations that frequent the Everglades National Park and Big Cypress National Preserve. The latter is now protected as Florida panther habitat under court order. FDEP now has in its possession or ready access to data, analyses, ecotoxicological risk assessments, transport-fate-bioaccumulation models, and reports demonstrating that the reproductive success of the endangered Florida panther is significantly compromised by a diet that includes a substantial portion of raccoons, otters, and/or small alligators at methylmercury concentrations equivalent to 0.3 ppm THg as MeHg in the

reference freshwater top-predator sport fish species, the largemouth bass. USEPA was unable to calculate a wildlife WQC to protect the Florida panther in USEPA's Mercury Report to Congress, because it would be strongly influenced by local food webs and foraging preferences rather than national averages: http://www.epa.gov/ttn/atw/112nmerc/volume6.pdf . However, it is possible to perform a Florida panther ecotoxicological risk assessment using local food web contamination and individual animal foraging preferences appropriate to the Everglades/BCNP: http://books.google.com/books?id=aUBcpzi4NF4C&pg=PA40&lpg=PA40&dq=Mace+Barron+Florida+panther&source=bl&ots=BH2hhdcjAf&sig=YXaBip6m55DJqUBVhw5jd_E_4Z4&hl=en&sa=X&ei=Zc8yULj1PIfY2gWQroDICQ&sqi=2&ved=0CDMQ6AEwAw#v=onepage&q=Mace%20Barron%20Florida%20panther&f=false. Florida panther exposure is especially problematic for the reproductive success of the Florida panther when that predation occurs during her pregnancy, when she is increasingly less effective in obtaining access to larger prey animals due to loss of habitat or insurmountable barriers to habitat and/or intra-species competition with larger, more aggressive males and/or less effective and efficient in the hunt and kill once such prey are located. Based on the observation by USEPA Region 4 staff that there has been no substantial decline in the atmospheric deposition of mercury http://www.epa.gov/region4/sesd/reports/epa904r07001/epa904r07001.pdf to the ENP between 1994 and 2007, one would not expect the concentrations in herbivores to have decreased, as well. I used the domestic cat NOAEL of 0.02 mg/K-day obtained by Charbonneau and co-workers (Charbonneau et al. 1976, the results of which were tabulated in the Florida Panther Interagency Committee Report, 1989), an inter-species protection factor of 3, methylmecrur BAFs appropriate to the Everglades, and foraging preferences identified by the USFWS as typical of the Florida panther to perform screening-level, steady-state, range-of-values ecotoxicological risk assessment for the Florida panther. It indicates that that toxic effects can be anticipated within typical ranges of exposure to methylmercury concentrations equivalent to 0.3 ppm in LMB, with a Hazard Quotient of approximately 2:1. If the pregnant female forages atypically disproportionately on raccoon, juvenile alligator, or otter, the HQ increases substantially. That being the case, FDEP has an affirmative duty and obligation to carry out the more rigorous dynamic, probabilistic ecotoxicological risk assessment for the Florida panther, as well as a reference threatened or endangered fish-eating bird species (e.g., the bald eagle and the wood stork), an endangered mammal species (e.g., the Everglades mink), and an endangered reptile (e.g., the North American crocodile). To do otherwise is a violation of the Federal Clean Water Act and Federal Endangered Species Act. http://www.crcnetbase.com/doi/abs/10.1201/9781420032505.ch16

Based on that dynamic, probabilistic ecotoxicological risk assessment, the State of Florida has an affirmative duty to find officially that the proposed 0.3 ppm target is or is not also fully protective of all threatened and endangered species, migratory bird species, and any other Florida or Federal trust wildlife species. If not, Florida has an affirmative duty to derive, promulgate, and implement a methylmercury Water Quality Criterion to protect fish- and shellfish-eating wildlife that is more protective than that for the protection of human health. Instead, the Revised Draft Report does not even commit to anything more than the importance of somebody continuing to monitor mercury bioaccumulation in wildlife other than FDEP. The failure of the Federal Government to act in a meaningful way to protect Federal trust wildlife species from an inadvertent taking by methylmercury contamination is no justification for the State of Florida not to act in this regard under its equivalent Florida statutes and rules. Until that is done, the statewide mercury TMDL must be considered scientifically, administratively, and legally deficient and a point of third-party contention and legal entry to the regulatory process.

The Statewide Mercury TMDL Omits Significant Sources That Are Not Under CWA Control: Groundwater Discharge into Drainage Lakes and The Land Application of Biosolids

The Contribution of Groundwater Discharge

The calculation of the TMDL and the LA omits significant natural sources of mercury species, i.e., lakes and streams receiving various proportions of seasonally appropriate low flow via groundwater discharge to the lake. A majority of Florida's lakes are seepage lakes, yet the one-time statewide mercury monitoring campaign omitted groundwater monitoring altogether and aggregated seepage and drainage lakes for purposes of evaluating the chemical factors that influence the mercury loading rate-methylmercury bioaccumulation relationship. Thus, one is left to infer from a review of the limited relevant literature what the concentrations of THg and MeHg in surficial aquifers might be. For this screening-level exercise, the average values from the Biscayne aquifer studies in South Florida will be used to fill this critical gap. However, surficial groundwaters receiving leachate from land-applied biosolids are likely to contain higher than background concentrations in both mercury species.

Lake Annie, which was omitted from the one-time statewide mercury monitoring campaign, is a well-studied sink-hole lake in Central Florida with a "do not eat" fish consumption advisory for mercury in largemouth bass http://www.doh.state.fl.us/floridafishadvice/2012Brochure.pdf. During the course of a USGS water budget study, the annual rainfall was 43", ET was 53", and groundwater inflow was estimated to be 240" in water depth equivalents. http://fl.water.usgs.gov/PDF_files/wri98_4133_sacks.pdf This may have been an atypical year for Lake Annie, because for most lakes in the region, evapotranspiration equals or exceeds rainfall by a few inches, not ten. However, it underscores the importance of taking into account abnormal and normal antecedent physical, chemical, and biological conditions and the abnormal and normal seasonal variations in water chemistry associated with those antecedent conditions to understand where the lake is in its biogeochemical trajectory for purposes of developing a waterbody-specific mercury load-methylmercury bioaccumulation relationship from which a waterbody-specific mercury TMDL and WLA derive.

If the rains contain a depth-weighted annual average THg concentration of, that is equivalent to a an annual mercury load of 14.5 ug/m^2-yr. Dry deposition may increase the wet atmospheric deposition contribution value of 25% to 50%. The value calculated for Central Florida in a study of runoff from a paved area was 22% http://etd.fcla.edu/CF/CFE0000959/Fulkerson_Mark_200605_PhD.pdf, but that could have been biased low due to the preferential retention of reactive mercury species, so a value of 35% would appear more appropriate for this screening-level exercise. Based on a USGS study of groundwater in South Florida http://pubs.usgs.gov/sir/2007/5240/ the average concentrations of THg and MeHg in the surficial Biscayne aquifer were 0.42 ng/L THg and 0.058 ng/L MeHg. The corresponding loading rate of THg to Lake Annie was calculated to be roughly 15% and 12% of the combined total without and with a dry deposition contribution of 35%. However, if, as others have calculated and FDEP has adopted, natural background is only 30% of wet and dry atmospheric deposition to the State of Florida on average, the groundwater inflow contribution in the Lake Annie case is roughly 45% of the statewide average contribution from wet and dry atmospheric deposition to the irreducible natural background THg load and 31% of the new combined natural background contribution total. Thus, groundwater makes a very substantial contribution to the irreducible natural background load and a substantial contribution to the mercury budget upon which is to be based the mercury load-methylmercury bioaccumulation relationship or the multivariate regression analysis of the influences of water quality on that relationship. The rate of methylmercury production in Lake Annie is not known, so it is not possible to compare the significance of the allocthonous and autocthonous contributions of methylmercury to Lake Annie at this time. Nevertheless, if wet deposition of MeHg is typically 2.5% of that for THg statewide per the work of Hammerschmidt and co-workers for the continental U.S. as a whole http://www.met.sjsu.edu/faculty/bornstein/old/papers/AqueousMethylation.pdf , although the Florida

value may be lower by a factor of 5 (Tom Atkeson, FDEP, personal communication). If the same proportion holds for dry deposition of MeHg as for THg, then the groundwater contribution for this specific circumstance is about 1.8 times the contribution from wet and dry atmospheric deposition or 64% of the new combined total allocthonous contribution, and, if the same ratios hold for natural background for MeHg as for THg, the groundwater contribution is 6 times the natural background contribution from wet and dry atmospheric deposition or 86% of the new combined total MeHg natural background contribution. This biases the groundwater contribution high, however, because there is no accounting for the direct runoff contribution of MeHg to Lake Annie, but for watersheds in which there is no land application of fertilizer or biosoilds, the MeHg in stormwater runoff originates primarily with the inorganic mercury in wet and dry atmospheric deposition with subsequent methylation in the surficial soil or sediment in upland wetlandsin the watershed, so from the state's perspective, this is double-counting of the wet and dry atmospheric deposition contribution to the lake's methylmercury production and bioaccumulation, and only the waterbody-specific ratio of mercury load-methylmercury bioaccumulation is affected, not the linearity of its response to a load reduction. However, if the lake is receiving more of its mercury load from an uncontrollable natural background source such as groundwater, then the corresponding reduction of the controllable load must be greater than the 86% calculated by FDEP to reduce the concentration of MeHg in LMB flesh in the 90th percentile lake to the water quality target of 0.3 ppm THg as MeHg in fish flesh. When this calculation is carried out taking into account the observed natural background contribution that groundwater made to the Lake Annie mercury budget under the hydrological conditions observed during the USGS study, Lake Annie is over-allocated by 5%. So, the groundwater contribution does affect not only the water-body specific THg and MeHg mass budgets but the responsive of the lake to a reduction in the wet and dry atmospheric deposition contribution from air emissions sources controlled under the CAA.

In addition, an accurate waterbody-specific mercury mass budget for Lake Annie would also have to account for the direct runoff contribution, and that, in turn, should be one of the variables in the statewide mercury water quality model. Unfortunately, while the author of the multivariate regression analysis was able to cleverly infer and partially but not completely account for the relative contributions of direct deposition and runoff on lake water quality and the mercury load-methylmercury bioaccumuation relationship from the ratios of the concentrations of natural and anthropogenic tracers in the sediment, it would have been more direct to include the ratio of watershed to waterbody surface area as one of the independent variable in the development of the statewide mercury "water quality model." This is also true of the parsing of seepage and drainage lakes, the for which the author was also able to partially but not completely account. Moreover, the %MeHg in filtered groundwater in the Biscayne aquifer (~14%) is only slightly higher than the corresponding %MeHg in filtered water from the lakes studied by FDEP (12%) in its one-time statewide mercury monitoring campaign, so it is possible that the biogeochemical control of the distribution of MeHg amongst dissolved, complexed, and particulate phases is predominated by the same influential chemical factors in groundwater and surface water, especially in seepage lakes, with the shielding of MeHg from the sunlight-driven physical, chemical, and biological processes extant in open surface waters playing only a secondary role. The use of stable mercury isotope analysis should clarify the origin of the inorganic mercury and methymercury in groundwater: (1) wet and dry atmospheric deposition, (2) land application of fertilizers or biosolids, and/or (3) leaching from aquifer material and *in situ* MeHg production. Clearly, there are lakes where the contribution of groundwater to the mercury species mass budgets cannot be ignored. Perhaps the sources, fate, and contributions of groundwater recharge to mercury cycling in seepage lakes can be made a research priority.

The Contribution of Legacy Sediments

The calculation of the TMDL and the LA omits significant contributions of uncontrollable nonpoint sources, including soil and sediments containing legacy inorganic mercury residues contaminated by

historically much higher anthropogenic sources of inorganic mercury. Using a diffusive exchange calculation, the median THg concentration in sediment, and the median log $K(Hg(II)^{+2}$ value of 5.1 calculated from the water quality data collected in the one-time statewide mercury monitoring campaign, the calculated flux from the active sediment layer of 4 cm is 9% of the annual average wet and dry atmospheric deposition flux of 22 ug/m^2-yr. That increases to 52% when one invokes a six-fold enhancement of the $Hg(II)^{2+}$ flux attributable to dense bioturbation, as was measured in flux chamber experiments in a well-characterized reservoir environment http://www.clu-in.org/download/contaminantfocus/mercury/Fate-Transport-and-Transformation-of-Mercury.pdf; http://www.dissertations.wsu.edu/Thesis/Fall2011/s_cox_112911.pdf When the USEPA nationwide average og $K(Hg(II)^{+2}$ value for sediment is substituted for the water column value obtained in the FDEP study, the undisturbed and highly bioturbated sediment/water exchange flux increases to 40% and 238% of the annual average wet and dry deposition flux. If the water column Kp value is reduced by the same proportions as USEPA's national average water column and sediment Kp values (4.9/5.3)*5.1, the undisturbed and bioturbated values increase to 83% and 500%, respectively.

Clearly the release of legacy $Hg(II)^{2+}$ from historically contaminated sediments can make a substantial contribution to the inorganic mercury budget of a lake and stream, and this could have a substantial influence on MeHg production and bioaccumulation, unless it is assumed that it is in a form that is not bioavailable to methylating bacteria. This phenomenon was reproduced in a stable isotope dosing study of an experimental lake in Canada for the METAALICUS Project, where less than 1% of the legacy $Hg(II)^{2+}$ in the sediment reservoir was methylated. Whether this phenomenon is generalizable from one northern temperate lake to all subtropical Florida lakes remains to be observed and calculated in a representative set of drainage and seepage lakes with a measured or calculated rate of sedimentation from which to infer the clearance rate of legacy $Hg(II)^{2+}$. This also underscores the importance of biogeochemical kinetics over equilibrium thermodynamics in dictating the pathways and rates of transport, speciation, and transformation of mercury species in the aquatic environment. This is also proof of the concomitant logical fallacy of simultaneously assuming that a lake or stream has reached steady-state conditions in response to the long-term average wet and dry mercury deposition flux, when those assumption are mutually exclusive. In the interim, however, it would seem prudent to include the contribution of the present-day sediment/water exchange flux of dissolved $Hg(II)^{2+}$ from sediment pore water to the overlying water column as one of the influential factors in the statewide mercy water quality model obtained via multivariate regression analysis.

This $Hg(II)^{2+}$ flux may be offset to some, a great, or a complete extent by the net evasion of Hg(0) generated by the photoreduction of DOC-complexed $Hg(II)^{2+}$, as was also observed for the simulated wet and dry atmospheric deposition in the METAALICUS study. However, that cannot be assumed to be the case for the median or representative worst-case 90th percentile lake or stream, especially in deep lakes and/or lakes with a high dissolved organic carbon (DOC) concentration, without further analysis, integration, and synthesis that can only be achieved through mechanistic mathematical modeling. Such models have been available to FDEP since the turn of the new millennium. http://www.clu-in.org/download/contaminantfocus/mercury/Fate-Transport-and-Transformation-of-Mercury.pdf

The Florida Mercury TMDL Ignores the Contribution of Anthropogenic Land Uses, including Land-Applied Fertilizers and Biosolids

Known mercury sources of air emissions to Florida include coal-fired power plants, medical waste incinerators, crematoria that do not remove mercury fillings before cremation, dental amalgam: http://www.epa.gov/region5/mercury/pdfs/dentaloptions3.pdf, municipal landfills: http://www.bvsde.paho.org/bvsacd/cd48/4658.pdf and land-applied municipal sewage sludge: http://www.scribd.com/doc/64712811/Biosolids-Application; http://www.weao.org/assets/docs/residualsBiosolids/final_report.pdf This last is not only a source of

stormwater runoff to nearby lakes and streams and seepage of leachate containing inorganic mercury, methylmercury, and elemental mercury to the underlying surficial aquifer, it is also a source of evasion of the gas phase of elemental mercury and methymercury http://web.visionlearning.com/carpi/Hg.htm and dry deposition of dust particles suspended by wind, predominantly but not exclusively within the watershed. http://www.scribd.com/doc/72647699/Morrison-R-2005-Environmental-Forensics-Contaminant-Specific-Guide ;http://www.newmoa.org/prevention/topichub/22/Hg_Report_Vol_3_Conclusions_References&Appendices.pdf A mercury soil transport-fate model adapted by USEPA's Office of Research and Development from the GLEAMS platform for small catchment areas, which includes evasion, leaching, and runoff and was parameterized and calibrated to South Florida conditions, has been available to FDEP since its publication in 1999: http://www.sciencedirect.com/science/article/pii/S0045653598006018.

The calculation of the statewide mercury TMDL and the WLA omits the contribution of significant controllable nonpoint sources within the watershed, including the local atmospheric deposition of wind-eroded THg- and methylmercury-contaminated particles and stormwater runoff of leached and particle-bound THg and methylmercury from decommissioned and active sites of land application of biosolids, which FDEP's own permit-mandated monitoring data document substantial contamination with THg above natural soil background levels. For quantitative perspective, according to a Florida Department of Commerce Report, in 2010 there were 37,691 dry English tons of imported and 217,303 dry English tons of Florida-originating land-applied biosolids in Florida. The average THg concentrations from each source were by FDEP to be 0.88 and 0.68 mg/Kg dry weight, respectively. That amounts to 73 of lbs of THg per year in imports and roughly 325 lbs of THg in land-applied biosolids of Florida origin. For a sense of mass proportion, the corresponding contribution from all point sources in Florida discharging at a water concentration equivalent to the existing Class III numerical mercury WQS of 12 ng/L is about 88 lbs/yr, while that is reduced by an order of magnitude when one substitutes for the existing mercury WQS the water quality target equivalent to LMB fish flesh of 0.3 ppm, which FDEP calculates to be 1.25 ng/L THg in unfiltered surface water, and by another order of magnitude if one substitutes the method detection limit routinely achievable by FDEP of 0.1 ng/L in surface water. Clearly one must take into account waterbody-specific and statewide median and upperbound contributions to biosolids application-related aerosol deposition, evasion, leaching to groundwater, and stormwater runoff in excess of the permit-mandated on-site stormwater retention capacity, the condition, transport, application, cover, and monitoring of which is regulated under appplicable waste and wastewater statutes, regulations, standards, and guidelines. The omission of mercury species originating with land-applied biosolids from the waterbody-specific and statewide mercury TMDLs is a fatal flaw that must be corrected prior to submittal of a new Revised Draft Hg TMDL Report to USEPA Region 4 for review and comment.

The Mercury Loading Rate-Methylmercury Bioaccumulation Relationship Is Not Accurately Calculated

The assumption that all lakes and streams have reached a steady state condition with respect to their long-term average mercury wet and dry atmospheric deposition loading rates is an administrative expedient not based on sound science and contradicted by the relevant facts:

- presupposes that there are no significant mercury sources in the watershed unrelated to atmospheric deposition, which is not true;
- presupposes that the contributions from wet and dry atmospheric deposition have not changed significantly over the response time of each waterbody, which is highly unlikely, based on the fact that Florida led the nation in local source mercury emissions reduction in the 1980s and early 1990s;
- ignores the potentially substantial contribution of the flux of inorganic mercury from sediments contaminated with historically higher mercury deposition fluxes;

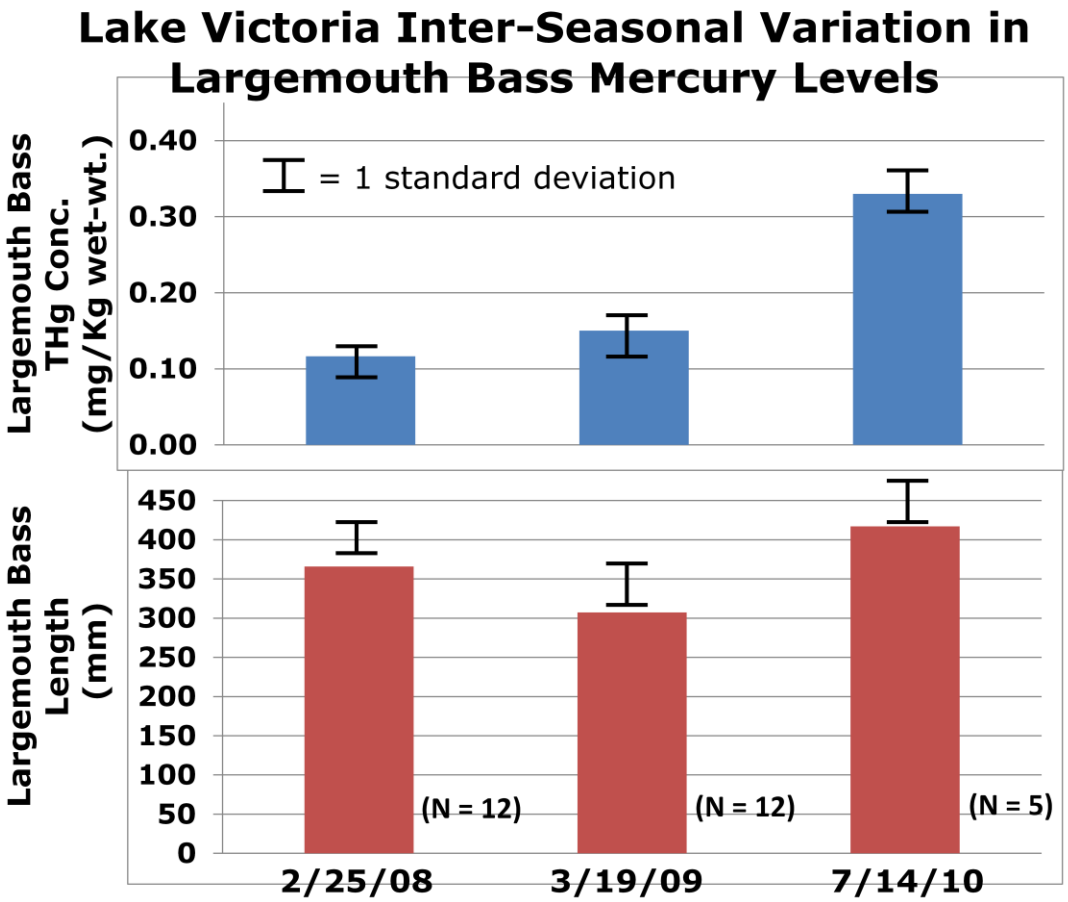
- one can infer from the mercury monitoring, research, and modeling literature and data by or for FDEP or accessible to FDEP in the scientific, regulatory, and consulting literature that the response time of a waterbody to mercury load reduction is on the order of the time it takes a waterbody to deposit a few millimeters of undisturbed sediment, which is one the order of months to years, not decades or centuries;
- unfortunately, the one-time, statewide mercury monitoring campaign omitted a measurement of the sedimentation rate and the statewide mercury TMDL development process omitted the modeling of the sedimentation rate;
- the sedimentation rate is also strongly influenced by trophic status, but the study design failed to parse phosphorus, nitrogen, and light-limited lakes or measure C:N:P ratios in algae or photosynthetically active radiation (PAR), which also influences the pathways and rates of photoxidation of methylmercury to inorganic mercury and the photoreduction of inorganic mercury to elemental mercury with subsequent evasion.

If it were true that every water body has reached a steady state between its long-term average mercury atmospheric deposition loading rate and the rates of methylmercury production and bioaccumulation, then to integrate out the water quality variation at every time scale, the long-term averages of the water quality parameters should have been substituted for the one-time sampling results. This was not done, because it would have substantially reduced the number of parameters that one could take into consideration in the multivariate regression. So the water data are inherently "noisy". The calculation of the TMDL fails to take into account that the physical, chemical, and biological influences on the relationship between the mercury species loading rates and methylmercury production and bioaccumulation in a water body vary in magnitudes, durations, and frequencies, such that one-time sampling cannot reveal those influence on that relationship. The calculation of a statewide mercury load-methylmercury bioaccumulation relationship fails to take into account the biogeochemical cycles of carbon, oxygen, sulfur, iron, manganese, and the limiting nutrient, which is frequently but not always phosphorus in fresh waters and nitrogen in salt waters. The influence of those cycles cannot be extracted from data collected by multivariate linear regression analysis of water, sediment, and fish data collected in a one-time statewide mercury monitoring campaign that omitted the sampling of sediment pore water where the mercury methylation and demethylation action is.

The Statewide Mercury TMDL Fails to Account for Seasonal Variation

Clean water Act Section 303(d)(1)(C) requires that a TMDL be calculated taking into account seasonal variation in water quality. The statewide mercury monitoring campaign cannot account for seasonal variation in water quality, because with only a few exceptions, each waterbody was only sampled one time. There was no systematic attempt to sample the waterbodies in the same season to factor out seasonal differences within and between waterbodies, because seasonal differences were a matter of no consequence, so the study design was fatally flawed. The calculation of the statewide mercury TMDL fails to account for seasonal variations in mercury species loading rates and physical, chemical, and biological conditions mediating the loading rate-concentration relationship in selecting the design conditions that represent a seasonally appropriately infrequent minimum in the mercury assimilative capacity of various categories of standing and flowing receiving waters.
If it were true that every water body in Florida has reached a steady state between its long-term average mercury atmospheric deposition loading rate and the rates of methylmercury production and bioaccumulation, then to integrate out the water quality variation at every time scale, the long-term averages of the water quality parameters should have been substituted for the one-time sampling results in the state's "water quality model". This was not done, because it would have substantially reduced the number of parameters that one could take into consideration in the multivariate regression. So the water data are inherently "noisy". A random sampling of various waterbodies included in the study indicates that there were substantial differences between the one-time sampling results and the long-term average

values for many of the parameters in the statewide routine lake and stream monthly water quality monitoring program. Based on the results in the eight lakes that were resampled in two distinct seasons, there are sufficiently significant differences in the average LMB concentrations between seasons that increase the probability of concluding that the waterbody is not mercury-impaired when it is in 4 of 8 lakes. When the LMB concentrations are size-standardized to 15" length using a waterbody-specific regression relationship of the log-transformed data, the frequency of that administrative error decrease from 4 to 3 lakes. Thus, the data obtained in the few excursions from one-time sampling demonstrate administratively significant seasonal variation that cannot be ignored and that can only be accounted for in a scientifically rigorous way by long-term seasonal sampling of water, sediment, and fish. The assumption that all lakes and streams have reached a steady state condition with respect to their long-term average mercury wet and dry atmospheric deposition loading rates is an administrative expedient that is not based on sound science, is contradicted by facts in evidence, and is contrary to the letter and intent of Section 303(d)(1)(C) of the CWA. See unlabelled figures 1, 2, and 3 below.



Statewide Mercury Monitoring Campaign Inter-Seasonal Variation: Largemouth Bass THg Concentrations

	Un-Standardized 1st Sampling Event Average	Std. Dev.	Standardized 1st Sampling Event	No. of Fish	Un-Standardized 2nd Sampling Event Average	Std. Dev.	Standardized 2nd Sampling Event	No. of Fish
Lake Victoria	0.12	0.03	0.22	12	0.15	0.06	0.12	12
Lake Dexter	0.22	0.12	0.44	9	0.19	0.08	0.20	12
Lake Weir	0.32	0.10	0.60	9	0.42	0.16	0.50	12
Lake Yale	0.18	0.03	0.20	10	0.18	0.09	0.21	12
Lake Jackson	0.21	0.10	0.26	12	0.46	0.22	0.40	8
Lake Ellen	1.26	0.18	1.17	6	0.67	0.26	0.78	12
Suwanee Lake	0.17	0.03	0.27	12	0.29	0.11	0.34	12
Lake Parker	0.08	0.03	0.16	9	0.10	0.03	0.08	12
Lake Thonotosassa	0.05	0.02	0.05	9	0.15	0.07	0.14	12
Lake Catherine	0.90	0.20	1.50	8	1.05	0.26	1.32	8
Lake Kerr	0.36	0.17	0.66	8	0.62	0.22	0.63	12
Mildam Lake	0.24	0.10	0.50	9	0.44	0.19	0.38	12

Standardized = LMB THg Conc. Calculated at 15" Using LN-Linear Regression Relationship between THg Conc. and Length

Statewide Mercury Monitoring Campaign Inter-Seasonal Variation: Largemouth Bass THg Concentrations

	Un-Standardized Maximum Perecnt Difference between 1st & 2nd Sampling Event	Un-Standardized Type I Error	Un-Standardized Type II Error	Standardized Maximum Perecnt Difference between 1st & 2nd Sampling Event	Standardized Type I Error	Standardized Type II Error
Lake Victoria	-28.99		X	-78.49		X
Lake Dexter	15.31			-114.75		
Lake Weir	-28.17			39.43		
Lake Yale	0.33			-65.71		
Lake Jackson	-119.19		X	56.84		X
Lake Ellen	47.36			-30.33		
Suwanee Lake	-68.78		X	70.52		X
Lake Parker	-17.23			8.57		
Lake Thonotosassa	-214.45			68.33		
Lake Catherine	-16.99			24.20		
Lake Kerr	-70.25			21.75		
Mildam Lake	-87.94		X	45.07		

Standardized = LMB THg Conc. Calculated at 15" Using LN-Linear Regression Relationship between THg Conc. and Length

Due to the seasonal variation that was ignored in the design of the one-time, statewide mercury monitoring campaign and the analysis, integration, and synthesis of its results, there is a statistically significant probability that a resource manager will incorrectly conclude that a waterbody is not mercury-impaired when it is or that it has recovered from that mercury impairment as consequence of mercury atmospheric load reduction when it has not. The use of age, size-, or weight-standardized transformations of the fish data is unlikely to reduce the rate of committing such a critical error in judgment to acceptable levels. See the unlabeled figures 1, 2, and 3 above. The unacceptable probability of committing such resource management decision-making errors is a consequence of the flawed study design that followed from the faulty assumption that is contradicted by the study results, thereby negating the value of the study results and the mercury resource management and point source regulation decisions deriving therefrom. The margin of safety in the compounded assumptions adopted by FDEP to develop and implement the statewide mercury TMDL approach is inadequate to compensate for the tendency of resource managers to draw incorrect conclusions of such critical consequence. I amplify on this key finding below.

<u>The Margin of Safety Is Improperly Accounted For and Is Not Adequate to Compensate for the Compounded Errors and Uncertainties in Statewide Mercury TMDL Development and Implementation</u>

CWA Section 303(d)(1)(C) requires that the TMDL be calculated taking into account seasonal variation in water quality with an adequate margin of safety to compensate for any lack of knowledge about the relationship between the pollutant loading rate and its concentration in the receiving water. The applicable USEPA regulations and technical guidance allow for an explicit or implicit margin of safety in the pollutant loading rate-concentration relationship. As a matter of policy, Florida has chosen to invoke an implicit margin of safety in the various assumptions used in TMDL derivation. However, USEPA's applicable TMDL technical guidance requires that the sources and magnitudes of the margins of safety in the load-concentration relationship from those assumptions be made explicit. Florida calculates the statewide mercury TMDL improperly by including an allegedly adequate implicit margin of safety in the water quality target, not the mercury load-methylmercury bioaccumulation relationship. The implicit margin of safety in the water quality target is not adequate to compensate for any lack of knowledge about the mercury load-methylmercury bioaccumulation relationship.

p. 42:

This section purports to set forth the USEPA-approved approach to TMDL development and implementation. Step 5 in the allegedly USEPA-approved process is as follows:
"
(5) Establishing a margin of safety of the TMDL to address the uncertainties associated with the target development

This is not consistent with the language of CWA Section 303(d)(1)(C), which requires a margin of safety to compensate for any lack of knowledge about the relationship between the effluent limitation and receiving water quality after taking into account seasonal variation in the assimilative capacity of the waterbody for the pollutant of concern. See Exhibit A. It is also inconsistent with the USEPA TMDL regulations and technical guidance promulgated and published to implement that provision. See Exhibits B-E. According to the language and intent of the CWA TMDL provision, the margin of safety is supposed to be in the assumptions, approximations, interpolations, and extrapolations regarding the pollutant loading rate-receiving water concentration relationship, not in the water quality target. The margin of safety in the WQS promulgated to protect the public health, safety, and welfare is supposed to compensate for uncertainties in the toxicological sensitivity of the most exposed, most susceptible life stage of the most exposed, most susceptible humans. If the margin of safety were adequate in the water quality target of 0.3 ppm THg as MeHg in the flesh of the reference freshwater sport fish species, the

LMB, why in the last CWA-mandated WQS triennial review cycle did FDEP propose to replace the existing, deficient mercury WQS of 12 ng/L unfiltered THg in surface water by public noticing a lower proposed revised mercury Water Quality Standard of 0.2 ppm THg as MeHg in fish flesh to take into account the greater fresh and salt water fish consumption rates and background exposures to MeHg of the average Florida woman of child-bearing age (15-44) vs. the national average assumed in the derivation of USEPA's WQC of 0.288 ppm rounded up to 0.3 ppm (21 g/day for a 63 Kg woman vs. 17.5 g/day for a 70 Kg woman and 1.32 E-4 vs 2.7E-5 mg/Kg-day.) FDEP claims a 10-fold margin of safety in the use of USEPA's WQC as the target value relative to the threshold of effect value of 0.058 mg/L in cord serum blood. However, when one uses the same one-compartment uptake and depuration model used by USEPA in the derivation of the 0.3ppm WQC, the ratio is closer to 6:1, because the actual WQC derived in this way is 0.288 ppm, not 0.3 ppm, and when Florida's higher average fresh and salt water fish consumption rates are substituted for USEPA's 17.5 g/day and 1.7E-5 mg/Kg-day, that ratio diminishes to about 3:1, assuming, as USEPA did, that the percentage of THg as MeHg in fish is 95% and the absorption efficiency is 95%. If FDEP's assumptions of 100% and 100% are used instead, that ratio decreases to about 2.5:1. If one multiplies the 0.3 ppm value by the median seasonal variation of 1.93: 1 for size-standardized 15" LMB observed in the 8 lakes that were resampled in the statewide mercury monitoring campaign in two seasons to take into account seasonal variation, that margin of safety diminishes to about 2:1. If the statewide ratio of the 92th percentile fish to the 1/12th percentile fish is used to compensate for the tendency tfor people to bias what they consume to larger fish, a similar 2:1 ratio is obtained. If one combines the seasonal variation and fishing high bias, the margin of safety disappears.

If one uses the higher subsistence fish consumption rate of 135 g/day documented in a large, multi-year study conducted by academic researchers of African-American women living in the Southeast http://www.ncbi.nlm.nih.gov/pubmed/22225823, the margin of safety for this cohort disappears, even for the national average exposure assumptions used by USEPA in the derivation of the nationwide WQC of 0.3 ppm. Therefore, the subpopulation of childbearing-age minority women that are subsistence consumers of fish are at a substantial risk of giving birth to a child with a methylmercury-induced cognitive deficit that may or may not diminish as the child ages, contrary to environmental justice considerations. As the average income has declined relative to the increase in the cost of living over time, even prior to the onset of the Great Recession, there has been a concomitant increase in the magnitude, duration, and frequency of subsistence fish consumption and the increased health risks that portends, and this is one of the hidden costs of the loss of jobs that pay a living wage.

Finally, FDEP is assuming that exposure to MeHg is occurring in a consumer, occupational, and environmental vacuum, when one is being exposed simultaneously to multiple neurotoxic heavy metals, including lead, organometallics, including trubutyltin and its environmental degradates, and polychlorinated organic molecules bioaccumulating in fish and shellfish, including polychlorinated dioxins, furans, and biphenyls (PCBs). In fact, USEPA had to derive the methylmercury reference dose by deconvolving the influence of PCBs to which the study population was being simultaneously exposed assuming a linear additivity to the contribution of PCBs and MeHg to the observed neurotoxic effect of cognitive deficit. One must acknowledge that there is greater uncertainty as to the pathways, rates, mechanisms of action, and toxicological consequences of exposures to neurotoxic pollutants other than MeHg, including whether the additivity model is accurate for all such combinations. In the context of all of the preceding discussion regarding the erosion in the margin of safety as one systematically substitutes Florida-specific for national exposure assumptions, one's confidence in the adequacy of the margin of safety in the MeHg reference dose has been substantially undermined on the toxicological side, so FDEP cannot then invoke its adequacy on the mercury load-concentration relationship side. Thus, the implicit margin of safety that FDEP claims is adequate as a consequence of how the 0.3 ppm THg as MeHg in fish flesh water quality target is derived and implemented is both administrative deficient and scientifically inadequate, so FDEP must adopt a margin of safety in the derivation of the mercury load-concentration

relationship such that the contributions to the combined margin of safety made by the set of assumptions, approximations, interpolations, and extrapolations are made explicit, even for an implicit margin of safety.

So, for example, if I assume that every waterbody in the state has reached a steady state with its long-term average mercury loading rate from all direct and indirect in-state, national, continental, global, and natural background mercury air emissions sources to justify the use of a linear load-concentration relationship and load reduction, one cannot then use the results of a one-time statewide mercury monitoring campaign to reduce the uncertainty introduced by that assumption, because one can only reduce that uncertainty by conducting seasonally relevant long-term monitoring of the reference sport fish THg as MeHg concentrations. FDEP has data and reports in its possession or to which it has access in the scientific, regulatory, or consultant literature demonstrating significant inter-seasonal and inter-annual variation in LMB THg as methylmercury concentrations that does not disappear when the fish are standardized by age, size, or weight. Nor can one ignore results contrary to that assumption, including the observed substantial and statistically significant difference in LMB THg concentrations for fish collected from the same waterbody in different seasons for the fish data in Appendix H, so the seasonal dynamics in fish reproduction status, growth rates, and foraging preferences preclude the attainment of steady state conditions or at least the assumption that one-time sampling of water and fish is representative of those steady state conditions, when only long-term monitoring can appropriately average out those seasonal fluctuations.

Some of that variability is due to the large range of the LMB, such that not all of the LMB harvested from a waterbody have spent all or the majority of their time foraging in that waterbody. In addition, precisely because LMB only slowly depurate the methylmercury they bioaccumulate, the methylmercury body burden they acquired while foraging during their rapid growth phase is their methylmercury contamination and concentration destiny, so even if the water column concentration of methylmercury subsequently increases or decreases by an order of magnitude, the large-bodied, slow-growing, prized lunker LMB have locked in the methylmercury to which they were exposed before the change. In essence it takes a LMB a lifetime for a methylmercury pulse to clear from the system and a new cohort of young-of-the year LMB to begin to bioaccumulate methylmercury under the changed conditions. However, while most LMB will regress the mean, some will have hot and cold streaks, so the within population variability will never disappear, even when a waterbody has achieved the hypothetical methylmercury production and bioaccumulation steady state condition with its long-term average external and internal mercury loading rates.
Only long-term monitoring of these inherently biogeochemically and biologically dynamic systems will average out these oscillations and allow one to calculate an accurate mercury loading rate-methylmercury bioaccumulation relationship using the LMB as the reference T4 sport fish species. Hence the need for a substantial margin of safety on the mercury load-concentration side separate from the nonexistent one invoked on the exposure-effects side.

p.82, Chapter 8: Determination of the TMDL

8.4 Margin of Safety
There are multiple lines of evidence to support the use of an implicit margin of safety in this TMDL. Consistent with the recommendations of the Allocation Technical Advisory Committee (Department, 2001), an implicit MOS was used in the development of this TMDL. Included in this implicit MOS is the assumption that all of the mercury in fish tissue is in the form of MeHg (the harmful fraction) and it is not. As discussed in Section 2.2, the application of a multifold increase in setting of the reference dose for MeHg is another significant component of the Margin of Safety (MOS). As noted previously, compared to other fish species, Largemouth Bass have higher overall tissue MeHg concentration because their position in the food chain dictates a longer food chain length for bioaccumulation. Use of Largemouth

Bass for the TMDL target development provides another margin of safety to the TMDL as all other fish living at lower trophic levels will also benefit.

There Is No Margin of Safety in the Assumption that All of the THg is MeHg in LMB Flesh

In the late 1990s USEPA published a method for ultra-trace total mercury (THg) analysis in fresh and salt water, sediment, and fish as Method 1631 for use in the NPDES permit program. The link to the set of USEPA-approved methods is contained in Exhibit E. The corresponding method for ultra-trace MeHg analysis in water, sediment, and fish, Method 1630, was published in draft for comment but was never formally adopted for application in the NPDES permit program. Instead, USEPA decided to regulate exposure to MeHg using fish and shellfish flesh as the representative medium for regulation rather than the water itself and total mercury (THg) rather than MeHg as the representative analyte for regulation. This made sense because (1) fish and shellfish are the predominant pathway of MeHg exposure to humans and wildlife, (2) most of the THg in fish flesh is MeHg, and (3) analyzing THg is more accurate and less expensive than analyzing MeHg in fish flesh. so analyzing for THg as MeHg in fish flesh would implement the revised mercury WQS without being overly burdensome in terms of a regulatory margin of safety, that is, there is an acceptable probability of committing Type I error: concluding that the waterbody is mercury-impaired when it is not. In fact, more than 90% of MeHg is THg in more than 90% of the LMB from at least 90% of Florida's freshwaters, so there is no margin of safety introduced by the assumption that all of the THg is MeHg in a mercury TMDL based on that assumption. FDEP claims to the contrary are contradicted by the facts, including common knowledge, data already in its possession, and data it could obtain if it analyzed a representative randomly selected subset of the LMB archived in its ultra-cold freezer at FWC's Eustis office. However, the ultra-trace MeHg analytical method used by FDEP for surface water and sediment but not fish flesh is not substantially equivalent to the ultra-trace MeHg analytical method used by Region 4 in states that could not or would not conduct the required ultra-trace MeHg analysis in surface water: USEPA Method 1630. So it is not clear whether USEPA Region 4 will approve FDEP's use of this alternative method in calculating LMB MeHg BAFs and MeHg-to-THg ratios in surface water, especially in light of the fact that an earlier petition for substantial equivalence was rejected by USEPA and USEPA Region 4 staff declined FDEP's offer to conduct ultra-trace THg and MeHg analyses for REMAP III at a competitive price relative to commercial laboratories with ultra-trace mercury analytical capabilities because of FDEP's unapproved ultra-trace MeHg analytical method.

There Is No MOS in the Use of LMB to Define Mercury Impairment and Recovery

Regarding the use of LMB as the representative indicator species for mercury impairment in freshwater sport and commercial fisheries, the question is not whether LMB have higher average concentrations than all lower trophic level sport and commercial fish and shellfish species in Florida's fresh waters, but whether (a) LMB are adequately representative of all harvestable fish species at the same trophic level and (b) whether using the average, median, or 90th percentile THg concentration in LMB to define mercury impairment, calculate the required mercury load reduction, and monitor recovery is adequately protective of sport fish consumers, because the sport fishers bias their fish collection to the older, larger fish with the highest methylmercury concentrations, while the state statutes biases the determination of and recovery from impairment to the population mean for each waterbody, and the statewide 90th percentile fish is not equivalent to the water body-specific 90th percentile fish.

Even If All of the Sport Fish Harvested and Eaten Were at Trophic Level 3, the Use of Largemouth Bass Would Only Compensate for Within-Lake Seasonal Variation

The ratio of the median concentrations of THg as MeHg in the edible flesh LMB to sunfish species for Florida streams is 2.18. In general, LMB is a more popular sport fish than the sunfish species, but people

will only consume what they or a relative or friend who shares their bounty can catch, so even if a greater percentage of otherwise legal sunfish species are thrown back when a LMB is caught, nevertheless, some sunfish species will be caught and consumed, if only out of necessity than preference. However, even if 50% of the sport fish caught and consumed were at Trophic Level 3, the statewide diet-weighted average combined T3 and T4 sport fish BAF would be reduced by 36% and the corresponding water quality target would be increased by 36%, which is not sufficient even to take into consideration seasonal variation, as required by CWA Section 303(d)(1)(C), let alone to adequately compensate for the compounded uncertainties in the mercury load-concentration relationship.

The Statewide Mercury Load Reduction Was Not Accurately Calculated

I used the freshwater lakes and streams large-bodied sport fish data obtained by FDEP in Appendix H http://www.dep.state.fl.us/water/tmdl/docs/tmdls/mercury/merc-tmdl-appendix-h.pdf from the statewide, one-time mercury monitoring campaign to calculate the statewide descriptive statistics for the lake, stream, and combined waterbodies for the total mercury (THg) concentration in largemouth bass (LMB) fish flesh on a wet weight basis. The lake-specific and stream-specific averages for all LMB were calculated using all of the LMB collected in the study period, even if that included multiple samplings in the same season in the same year, the same season in different years, different seasons in the same year, and different seasons in different years. The seasonal variation in the LMB observed in waterbodies sampled in multiple season and its implications for the calculation of the statewide mercury TMDL, WLA, and point source WQBELs will be addressed in a separate formal public comment per subject.

I omitted sunfish species from the calculation of these statistics, because sunfish are smaller, faster-growing, and typically feed at trophic level three (T3), one trophic level lower than LMB (T4). That being the case, the average THg concentrations in sunfish species are almost always lower than the THg concentrations in LMB collected from the same waterbody at the same time. The inclusion of sunfish species would thus skew the fish concentration statistics low, as well as reduce the magnitude of the implicit margin of safety (M.O.S.) FDEP is claiming for its statewide mercury TMDL calculation, thereby undermining the credibility of the assertion of its adequacy. I will submit separate formal public comments on the deficiencies in the implicit statewide mercury TMDL M.O.S. per subject.

Based on the preceding data inclusion, exclusion, and analysis scheme, the statewide median THg concentrations in LMB on a wet weight basis in lakes, streams, and combined are, respectively, 0.34, 0.39, and 0.42 mg/Kg THg, while the corresponding 90th percentile values are, respectively, 0.74, 0.99, and 0.91 mg/Kg THg. Please confirm that the statewide 90th percentile LMB THg concentration value for all lakes and streams combined is 0.91 mg/Kg THg, not 0.74 mg/Kg THg used in the calculation of the required reduction in the controllable load allocation. Please make the needed corrections to the 90th percentile statewide LMB THg concentration and the corresponding revisions to the text prior to submitting the final draft Mercury TMDL for the State of Florida Report to USEPA Region 4 for review and comment.

One is also able to infer from this correction that the required statewide mercury loading rate reduction from the control of all in-state, in-nation, and global mercury air emissions sources of wet and dry atmospheric deposition to Florida waters must increase from 85% to 96% to attain and maintain the water quality target of 0.3 ppm THg in LMB flesh on a wet-weight basis in 90 percent of the freshwater waterbodies statewide. Please make the needed correction to the calculation of the required statewide mercury loading rate reduction of controllable air emissions sources and please make the corresponding revisions to the text wherever that erroneous value occurs or is used in a TMDL, LA, WLA, or WQBEL prior to submitting the final draft Mercury TMDL for the State of Florida Report to USEPA Region 4 for review and comment.

The unenforceable reduction in the loading rate of inorganic mercury wet and dry atmospheric deposition from all controllable in-state, U.S., continental, and global air emissions sources to attain the unenforceable water quality target of 0.3 ppm THg was calculated using an erroneous status quo reference value of 0.74 mg/Kg THg wet-weight as the 90th percentile concentration for all LMB in all the waterbodies surveyed in the one-time statewide mercury monitoring campaign, instead of the correct value of 0.91 mg/Kg THg wet-weight. If the statewide value for lakes and streams combined is used instead of the stream-specific value, greater than 10% of the streams will remain impaired after the target load reduction is effected. That being the case, it is more appropriate to use the 90th percentile value for streams, and when that is done, an impaired stream reference value of 0.99 mg/Kg THg wet-weight, which translates into a load reduction to achieve 0.3 mg/Kg wet-weight of 99%.

However, this is not an endorsement of the statewide approach to mercury TMDL development and implementation adopted by the State of Florida, where 1%, 5%, or 10% of Florida's lakes an drivers are sacrificed to administrative expediency. Nor is the margin of safety in the TMDL adequate to ensure that even those statistical targets will be hit. CWA Section 303(d)(1)(C) requires a waterbody-specific approach to attain the duly promulgated WQS. No waterbody shall be left behind in the process of developing or implementing a mercury TMDL at any scale. And no waterbody shall be delisted until all of its statewide and watershed-specific mercury source controls and best management practices have been implemented, the waterbody has had sufficient time to respond to the mercury load reduction, and follow-up monitoring demonstrates the long-term attainment and maintenance of mercury-unimpaired status. If state law requires otherwise, then the state law must be changed to comport with Federal law.

The Statewide Mercury TMDL-Related Load Allocation (LA) Was Not Properly Calculated

According to the USEPA regulations and technical guidance promulgated and published to implement CWA Section 303(d)(1)(C), the Load Allocation (LA) includes all uncontrollable nonpoint sources, both those over which nobody can exert control, e.g., natural background sources and sources from man-induced irretrievable conditions, e.g., abandoned mines and large-scale soil contamination in the watershed or large-scale sediment contamination in the waterbody, as well as sources originating outside of the jurisdiction of the United States of America, e.g., continental and global air emissions sources, and those within the jurisdiction of the U.S. but regulated under the authority of another statute, e.g., air emissions regulated by national technology-based and air quality-based standards promulgated under the Clean Air Act (CAA) in permits issued under the CAA. The CWA makes no provision for and claims no authority over nonpoint sources originating from air emissions sources regulated under the CAA, so the portion of the TMDL that is available for allocation to controllable point and nonpoint sources under the authority of the CWA is what remains after the combined loading rate contribution from all mercury sources outside the control of the CWA is subtracted from the TMDL with an adequate margin of safety. When the LA is recalculated to account for all nonpoint sources of mercury over which the CWA has no control, most Florida lakes and streams are over-allocated by the LA for mercury, that is the mercury TMDL - LA - M.O.S. $\leq$ 0, and for all such waterbodies the mercury WLA = 0, so the point source Water Quality Based Effluent Limitation (WQBELs) based on that WLA are 0, not the surface water-equivalent target value. This translates into no detectable discharge for purposes of monitoring point source permit compliance under the state-delegated National Pollutant Discharge Elimination System (NPDES) authorized by CWA Section 402(b). The routinely achievable method detection limit (MDL) for the analytical method for ultra-trace total mercury (THg) used by FDEP is 0.1 ng/L. Using the FDEP-approved ultra-trace THg analysis method, the effective point source mercury WLA is 0.7 lbs/yr, not 8.8 lbs.

The THg Concentration in Water Equivalent to the Water Quality Target in Fish Flesh is Not Adequately Protective of Florida's Water Resources: No Waterbody Left Behind

The water quality-based effluent limitations (WQBELs) for all point sources to a waterbody for which fishable and swimmable uses are otherwise attainable are calculated based on the TMDL - LA - M.O.S on a waterbody-specifc basis to attain and maintain the applicable numerical Water Quality Standard (WQS) with an acceptable magnitude, duration, and frequency of recurrence under appropriate conditions representing a seasonal minimum in the pollutant assimilative capacity to ensure the restoration and protection of its fishable and swimmable uses. There is no interpretation of the language of CWA Section 303(d)(1)(C) or the regulations or technical guidance promulgated or published to implement that provision that authorizes a statewide approach to pollutant TMDL development and implementation, even for a pollutant the predominant pathway for which is atmospheric deposition. However, if a statewide approach were to be taken, it would be unlawful to leave any pollutant -impaired waterbody impaired by any pollutant as a consequence of the way the statewide TMDL is calculated or implemented. The only lawful way to develop and implement a TMDL on a statewide basis would be to identify the waterbody in the state that has the greatest susceptibility to mercury-impairment, that is, the waterbody with the highest ratio of LMB THg as MeHg to the mercury species loading rates from all sources with a margin of safety in all of the assumptions that is considered adequate to protect a waterbody that was not studied but is more susceptible than the most susceptible waterbody studied. I refer to this as the no waterbody left behind philosophy and policy of the statewide approach. Unless and until that is done with an adequate margin of safety, the statewide approach is contrary to the letter and spirit of the CWA.

The Waste Load Allocation Was Not Properly Calculated

FDEP translated the unenforceable water quality target of 0.3 ppm THg as methylmercury in fish flesh on a wet weight basis into the equivalent target surface water concentration of THg in unfiltered surface water using the statewide median largemouth bass methylmercury bioaccumulation factor (2.67×10^6) and statewide median ratio of methylmercury to THg (0.093). The 90th percentile value (9.41×10^6) and 90th percentile ratio of methylmercury-to-total mercury (0.257) to take into consideration seasonal and statewide variation within and between water bodies and to provide a greater implicit margin of safety in the loading rate-concentration relationship. If the more protective approach is used, the state's 1.25 ng/L value is reduced by an order of magnitude. However, both values are above the routinely achievable method detection level claimed by FDEP's ultra-trace mercury analysis laboratory of 0.1 ng/L THg using USEPA-approved Method 1631 or a substantially equivalent method. When the LA > TMDL - MOS, the WLA = 0, and the default water quality-based effluent limitation (WQBEL) is no detectable concentration in the discharge using the most sensitive, USEPA-approved analytical method for THg in wastewater, Method 1631, not an unenforceable WQBEL based on attaining and maintaining a water concentration equivalent to the unenforceable water quality target.

The Waste Load Allocation Was Not Fairly and Equitably Distributed Between and Among States, Salt and Fresh Waters, and Point and Nonpoint Sources

The mercury TMDLs for inter-state water bodies were not fairly and equitably distributed between states prior to distributing Florida's far share of the remainder among controllable nonpoint sources and point sources. The mercury WLA was not fairly and equitably distributed between controllable nonpoint sources. e.g., land application of biosolids and point sources. The unenforceable reduction in the loading rate of inorganic mercury wet and dry atmospheric deposition from all controllable in-state, U.S., continental, and global air emissions sources to attain the unenforceable water quality target of 0.3 ppm THg assumes a linear relationship between the long-term average mercury deposition load and the long-term average methylmercury bioaccumulation in fish flesh, but the bioaccumulation values were based on a one-time, statewide monitoring campaign in fresh waters, so no long-term average values of LMB and

sunfish THg concentrations were obtained, and no effort was made to adjust those values to reflect and correct for observed inter-seasonal and inter-annual variation.

The One-Time, Statewide Mercury Monitoring Program Upon Which the Statewide Mercury TMDL Was Based Was Fatally Flawed in Design, Implementation, and Interpretation of Results

The one-time statewide mercury monitoring campaign was deficient in design, implementation, and analysis, integration, and synthesis of results. Among its many deficiencies:

- it omits all freshwater wetlands;
- it omits all brackish and salt water swamps, wetlands, lagoons, estuaries, and bays, in part because the method FDEP's laboratory uses for ultra-trace methylmercury analysis is no applicable to salt waters;
- it omits outstanding largemouth bass sport fisheries such as Lake Okeechobee and Lake Trafford;
- it cannot be demonstrated that the lakes and streams selected adequately span the relevant combinations of physical, chemical, and biological conditions and factors governing susceptibility to mercury impairment or the mercury load-methylmercury bioaccumulation relationship;
- it cannot be demonstrated that the number of lakes and streams sampled in each subcategory provides the required power and confidence levels to identify mercury-impaired waters with acceptable probabilities of committing Type I and II errors, let alone the physical, chemical, and biological conditions and factors that govern the mercury load-concentration relationship;
- in all but twelve lakes, sampling only occurred once in one season;
- it omits sediment solids acid volatile sulfide (AVS) and/or chromate reducible sulfide (CRS), both of which quantify the trace metal sulfides that are known or have been inferred to influence inorganic mercury bioavailability to methylating bacteria;
- it omits the sediment pore water compartment altogether, which is the only compartment in which the parabolic relationship between sulfate, sulfide, and methylmercury production is expected to be observed;
- none of the largemouth bass (LMB) were analyzed for methylmercury to validate FDEP's claim that the assumption that all THg is methylmercury in LMB flesh provides an adequate margin of safety;
- 49% of the sediment data were below the method detection limit of the FDEP's ultra-trace methylmercury analytical method, which has not been approved by USEPA for water, sediment, or fish as substantially equivalent to USEPA-published Method 1630.

The Ultra-Trace Methylmercury Analytical Method Used by FDEP for One-Time, Statewide Mercury Monitoring Campaign is Not Substantially Equivalent to USEPA Method 1630

USEPA Method 1630 is not published for compliance application in the Clean Water Act Section 402 NPDES permit program. That being the case, a regulatory agency cannot establish or enforce water quality-based effluent limits for methylmercury. However, Method 1630 is listed by USEPA as appropriate for other Clean Water Act applications. Such applications include mercury TMDL development under Clean Water Act Section 303(d)(1)(C). Using the example of Florida's statewide mercury TMDL development process, FDEP first calculates a largemouth bass-to-surface water ratio or bioaccumulation factor (BMF) for each water body and an unfiltered methylemercury-to-unfiltered total mercury (THg) ratio in water for each water body, and then uses the median values for both to back-calculate a statewide median THg concentration in unfiltered surface water equivalent to the 0.3 ppm THg as methylmercury in fish flesh on a wet-weight basis. In developing waterbody-specific mercury TMDLs

for the State of Georgia, Mississippi, and North Carolina, USEPA Region 4 used Method 1630 to obtain the required waterbody-specific methylmercury-to-THg ratios. The waste load allocations (WLAs) deriving from the TMDL are enforceable as water quality-based effluent limitations (WQBELs) in NPDES permits and those WQBELs enforceable using USEPA-approved Method 1631. A methylmercury analytical method that is not demonstrably substantially equivalent to USEPA Method 1630 would open a legal point of entry for a third-party challenge to a water body-specific or statewide mercury TMDL and any mercury WLA/WQBELs deriving therefrom. In addition to the preceding application, FDEP is claiming that the ample margin of safety in the statewide mercury TMDL includes the assumption that all of the THg in largemouth bass flesh is methylmercury, when it is not. In fact, it is common knowledge that > 95% of the THg is methylmercury in legal-sized, top-predator fish in general and in largemouth bass from Florida waters in specific. That would not constitute an ample margin of safety to offset the compounded uncertainties in the mercury loading rate-methylmercury concentration relationship in surface water. I believe FDEP has data in its possession that supports this common knowledge. Nevertheless, to demonstrate an ample margin of safety based on this assumption, FDEP must be capable of analyzing methylmercury in fish flesh in archived fish samples using a valid analytical method substantially equivalent to USEPA Method 1630.

The Statistical Water Quality Model Was Not Used In the Development of Implementation of the Statewide Mercury TMDL, Because the Model Failed

The so-called mercury water quality model, which is nothing more than a multivariate regression analysis of the log-transformed water, sediment, and fish data obtained in the one-time, statewide mercury monitoring campaign, combined with earlier data collected by FWC's Ted Lange, is the product of subjective professional judgment, not an unbiased, systematic statistical analysis, because it includes further transformations or nomalizations of some data but not others in order to linearly approximate inherently non-linear relationships, e.g., the sulfate-methylmercury relationship, or improve the linearity of the presumed relationships, e.g., the use of a Monod transformation of pH, in carrying out the multivariate linear regression analysis. Despite the best efforts of the analyst to obtain an adequate fit between the dependent variable, the concentration of THg as methylmercury in LMB flesh and various potentially influential independent water quality variables through these subjective transformations, the model failed, because known influences did not emerge, such as the influence of sulfate on the rate at which sulfate-reducing bacteria methylate the bioavailable fraction of inorganic mercury up to the point of sulfide inhibition of the methylation rate, probably via complexation. This is understandable, because the relationship between sulfate concentration and the methylation rate is parabolic, not linear, and it is only detectable in sediment pore water, not the overlying water column. However, had FDEP collected the requisite samples of pore water from the lakes it sampled, the difference between surface water and pore water sulfate concentrations could be used to infer the metabolic rate of sulfate reducing bacteria with which to evaluate its relationship to various water quality parameters governing inorganic mercury bioavailability, including theeffect of the daily redox cycle on the formation and dissolution of iron and manganese sulfides and polyslufides in the surficial sediment layer where methylation is occuring.

The Mechanistic Mercury Water Quality Models Available to FDEP Were Not Used for the Development of the Statewide Mercury TMDL

FDEP has had at its disposal since the late 1990s a mercury transport-fate model developed by USEPA's Office of Research and Development based on a modification of the GLEAMS model that is applicable to small watersheds and could have been used to evaluate the watershed runoff contributions of mercury to the receiving water from fertilized farmlands and biosolids application sites. FDEP has at its disposal since 2003, E-MCM(II), a mercury model capable of modeling methylmercury production and bioaccumulation in lakes, streams, and wetlands, as evidenced by the publication of the results of the application of a less sophisticated version, E-MCM(I), to quantify the mercury load-methylmercury

bioaccumulation relationship in Water Conservation Area-3A in the Everglades Mercury TMDL Pilot Study: http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/everglades_fs.cfm

Key Findings

The Mercury TMDL for the State of Florida Report to USEPA Region 4 that embodies the statewide approach to the development and implementation of a mercury TMDL, Waste Load Allocation, and wastewater points source Water Quality-Based Effluent Limitations:
-- sacrifices the most mercury-susceptible waterbodies as an administrative expedient, when the CWA Section 303(d)(1)(C) makes no such provision and requires that no waterbody be left behind in attianment of mercury-unimpaired status
-- fails to include a Florida-specific water quality target derived following USEPA guidelines, because the Florida women of childbearing age of median weight consuming salt water fish and shellfish at median rates with median concentrations of methylmercury are already over-exposed to methylmercury in excess of the USEPA reference dose to protect the developing fetus from cognitive impairment, so the allowable methylmercry concentration in freshwater fish is 0
-- fails to mention, let alone adequately consider seasonal variation in water quality in the derivation and implementation of the statewide mercury TMDL, when FDEP's own data demonstrate seasonal variation
-- claims an adequate margin of safety in the derivation and implementation of USEPA's methylmercury reference dose that disappear with the realization that USEPA calculated the reference dose assuming a 1:1 relationship between the blood of the fetus and the mother, when the actual value is closer to 1.7:1 according to USEPA's Kate Mahaffey
-- omits significant natural background sources of mercury species over which FDEP can exert no regulatory control under the CWA that must be included in the load allocation, i.e., groundwater discharge to seepage lakes
-- improperly assumes that others will reduce the nonpoint mercury source contribution to the mercury load allocation (LA) from air emissions sources over which it has no regulatory control under the CWA
-- when the load allocation is recalculated, the TMDL - LA - M.O.S. < 0, so the WLA = 0, and the water quality-based effluent limitations (WQBELs) deriving thereform are 0 and the effluent limitation equivalent to 0 is no detectable discharge using the most sensitive USEPA-approved analytical method promulgated for that purpose, i.e., Method 1631, not the THg concentration in water equivalent to the unenforceable mercury water quality target of 0.3 ppm in fish flesh
-- omits significant sources of mercury over which it can exert regulatory control under the CWA, i.e., land-applied biosolids
-- incorrectly calculates the mercury load reduction required to achieve the water quality target-equivalent surface water concentration
-- fails to fairly and equitably distribute the mercury assimilative capacities of shared surface waters with other states
-- fails to consider the impacts of the proposed administrative action on subsistence fishers protected by the environmental justice provisions of applicable statutes and Presidential Executive Orders
-- fails to demonstrate adequate protection of fish-eating wildlife and their predators in general and highly-exposed, threatened, endangered, and migratory species in particular, and
-- improperly allocates all of the unused mercury assimilative capacity to wastewater point sources;
-assumes that the statewide mercury TMDL is controlled by its in-land lakes and streams, when Florida's estuaries, lagoons, and bays are demonstrably more susceptible to mercury impairment under the same wet and dry mercury atmospheric deposition loads impacting its tributaries, as evidenced by Florida Bay;
-- adopts the mutually exclusive assumptions that lakes, streams, lagoons, estuaries, and bays will rapidly recover in response to mercury source reduction, because biogeochemical dynamics and kinetics favor the methylation of new inorganic mercury in atmospheric deposition over the old inorganic mercury in sediments, while assuming at the same time that all lakes and streams have reached a steady-state relationship between the long-term average wet and dry mercury deposition flux and the methylmercury

concentration in slow-growing, large-bodies, long-lived, top-predator sport fish represented by the prized largemouth bass (LMB), which is assumed to conveniently integrate out all of the seasonal variation in mercury species loading, transport, transformation, and bioaccumulation rates governed by the seasonal variation in biogeochemical dynamics and kinetics, such that sampling any lake or stream at any time of the year will conveniently yield the same mercury load-methylmercury bioaccumulation result; and
-- FDEP's own data contradict the steady-state assumption, as evidenced by the observed significant seasonal variation in the small subset of lakes that had to be resampled to fill their LMB quotas, so it follows that all lakes and streams have not reached a steady-state relationship between the long-term average wet and dry deposition mercury loading rate and the average methlymercury concentration in LMB flesh, so the seasonal variation in water quality and its influences on mercury species transport, disposition, transformation, bioavailability, and bioaccumulation cannot be ignored, and only long-term seasonal sampling of water, sediment, and fish can yield an appropriate load-concentration relationship for mercury TMDL development and implementation at every scale from water body-specific to statewide.

These are fatal flaws in the development and implementation of the statewide approach to the Florida mercury TMDL that must be corrected prior to submittal of the Revised Draft Hg TMDL Report to USEPA Region 4 for review and comment.

Key Recommendations

-- Obtain the background dose rate probability distribution function for women of child-bearing age from the consumption of fresh, frozen, and canned saltwater fish species using the probabilistic approach but now including the lognormal concentration distributions rather than average values of the concentrations of THg as MeHg by fish species.
-- Promulgate an enforceable, revised mercury WQS for total mercury as methylmercury in fish flesh on a wet-weight basis in this triennial review cycle that is adequately protective of the health of a typical subsistence consumer of salt and freshwater fish to replace the existing numerical Class III WQS of 12 ng/L total mercury in unfiltered water, which FDEP acknowledges is not adequately protective of human health.
-- Promulgate a revised mercury WQS for total mercury as methylmercury in whle fish on a wet-weight basis that is adequately protective of fish- and shellfish-eating wildlife species, including threatened species such as the bald eagle and endangered species such as the wood stork, the Everglades mink, and the Florida panther.
-- Develop an enforceable statewide mercury TMDL based on the more protective of the enforceable human health or wildlife WQS.
-- Properly recalculate the Load Allocation by accounting for the daily mass contribution rates from all mercury source categories outside of CWA control, including all in-state, out-of-state, continental, and global mercury air emissions sources and groundwater inflow under seasonally appropriate low-stage conditions.
-- Properly account for the mercury loading rates to waterbodies in watersheds in which one of the land uses is land-application of biosolids.
-- Allocate what remains of the unused mercury assimilative capacity between point and controllable nonpoint sources under the CWA, including the deposition of wind-eroded particles, leaching to the underlying surficial aquifer with subsequent inflow to the waterbody, and stormwater runoff in excess of the permit-mandated stormwater storage capacity to the waterbody.
-- If the TMDL-LA-MOS < 0, the WLA is 0 for all point sources and controllable nonpoint sources and set the point source water quality-based effluent limitations (WQBELs) to 0, which translates into no detectable discharge using USEPA Method 1631 or a method substantially equivalent to USEPA Method 1631.

-- If the WLA $\leq$ 0, impose a moratorium on the land-application of biosolids contaminated above Florida soil background levels.
-- During the biosolids land application moratorium, conduct an intensive study of a representative set of decommissioned and active biosolids land application sites in a representative set of watersheds containing a representative set of mercury-impaired and mercury-unimpaired streams and lakes, quantify the absolute and relative contributions of the aerosol, evasion, leachate, and runoff pathways to the seasonally appropriate mercury loading rates of a representative set of seepage and drainage lakes and streams using appropriate models, and back-calculate maximum allowable mercury concentrations in the biosolids from the unused mercury assimilative capacities of these representative lakes.
-- Use the statewide mercury LA as leverage with CAA programs to reduce mercury air emissions from sources over which the CAA has control to free up some of the over-allocated mercury assimilative capacity of the majority of Florida's fresh and salt waterbodies for the point and nonpoint sources over which the CWA has control.
-- Include a factor of 2 in the margin of safety in the statewide mercury TMDL to compensate for within water-body one-time sampling error of the representative long-lived, large-bodied freshwater sport fish, the largemouth bass.
-- Include another factor of 2 in the margin of safety in the statewide mercury TMDL to compensate for seasonal variation within waterbodies.
-- Include another factor of 2 in the margin of safety in the statewide mercury TMDL to compensate for variation between fresh waterbodies.
-- Include a factor of 3 as a margin of safety to ensure the protection of freshwater wetlands and salt waters omitted from the statewide mercury TMDL that are more mercury susceptible than the lakes and stream included in the one-time mercury monitoring campaign.
-- Rather than delisting mercury-impaired waterbodies upon completion of the statewide mercury TMDL, provide for follow-up mercury monitoring of a representative set of freshwater wetlands, lakes, and streams and brackish and salt water wetlands, lagoons, estuaries, and bays.
-- Calculate the required mercury load reduction to restore 95% of the states fresh waters with an adequate margin of safety for the inherently more uncertain statewide approach.

Thank you for this opportunity to review and comment on this most important administrative action or lack thereof.

Sincerely,

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Exhibit A

The Clean Water Act

http://www.epa.gov/oecaagct/lcwa.html

The TMDL Provision of the Federal Clean Water Act

"Section 303(d)(1)(C): Each State shall establish for the waters identified in paragraph (l)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those pollutants which the Administrator identifies under section 304(a)(2) as suitable for such calculation. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality."
http://water.epa.gov/lawsregs/guidance/303.cfm

Exhibit B

TMDL Regulations and Technical Guidance

General:
http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=68611527d82e2dcf115ba1a29e84efca&tpl=/ecfrbrowse/Title40/40cfr130_main_02.tpl

http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm

Mercury:

http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/mercury.cfm

Exhibit C

USEPA Water Quality Criteria Document for Methylmercury in Fish Flesh to Protect Human Health

http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/pollutants/methylmercury/index.cfm

Exhibit D

http://nepis.epa.gov/Adobe/PDF/P1003RPA.pdf

Guidance for Implementing the
January 2001 Methylmercury
Water Quality Criterion

Final

United States Environmental Protection Agency
Office of Science and Technology (4305T)
1200 Pennsylvania Ave., NW
Washington, DC 20460
EPA-823-R-09-002
www.epa.gov/waterscience
January 2009

Exhibit E

USEPA-Approved Analytical Methods for Use In Implementing Clean Water Act Regulatory Programs at 40 CFR 136
http://water.epa.gov/scitech/methods/cwa/

Method 1631: Ultra-Trace Mercury Analysis in Water, Sediment, and Fish
http://water.epa.gov/scitech/methods/cwa/metals/mercury/index.cfm

Other CWA Methods of Interest *not* Currently Approved for use at 40 CFR 136

Method 1630: Ultra-Trace Methylmercury Analysis in Water, Sediment, and Fish

http://water.epa.gov/scitech/methods/cwa/metals/mercury/upload/2007_07_10_methods_method_mercury_1630.pdf

Exhibit F

Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4, published on July 6, 2012. http://www.dep.state.fl.us/water/tmdl/merctmdl.htm

Exhibit G

The References in the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4, published on July 6, 2012. http://www.dep.state.fl.us/water/tmdl/merctmdl.htm

Exhibit H

Appendix H of the Revised Draft Mercury TMDL for the State of Florida Report to USEPA Region 4, published on July 6, 2012

http://www.dep.state.fl.us/water/tmdl/docs/tmdls/mercury/merc-tmdl-appendix-h.pdf

Exhibit I

Impaired waters

http://www.dep.state.fl.us/legal/rules/shared/62-303/62-303.pdf

62-303.470 Fish and Shellfish Consumption Use Support.
(1) In order to be used under this part, the Department shall review the data used by the DOH as the basis for fish consumption advisories and determine whether it meets the following requirements:
(a) The advisory is based on the statistical evaluation of fish tissue data from at least twelve fish collected from the specific water segment or water body to be listed,
(b) The data are collected in accordance with DEP SOP FS6000 (General Biological Tissue Sampling) and FS 6200 (Finfish Tissue Sampling), which are incorporated by reference, the sampling entity has established Data Quality Objectives (DQOs) for the sampling, and the data meet the DQOs, and
(c) There are sufficient data or other information from within the last 7.5 years that would support the continuation of the advisory. The Department shall document any decision to list waters with advisories older than 7.5 years, including the data supporting the continuation of the advisory or information demonstrating that older data are representative of current conditions.
(2) Waters with advisories determined to meet the requirements of this section or waters where scientifically credible and compelling information meeting the requirements of Chapter 62-160, F.A.C., indicates the applicable human health-based water quality criteria are not met shall be listed on the verified list. Any determinations to list waters based on this provision shall be documented, and the documentation shall include the basis for the decision.
(3) Class II waters shall be included on the verified list for coliform impairment if, following review of the available data as described in subsection 62-303.460(2), F.A.C.
(a) The number of samples above 43 counts per 100 ml meet the requirement in subsection 62-303.420(6), F.A.C., with the exception that paragraph 62-303.320(4)(a), F.A.C., does not apply and samples collected on different days within any four day period will be assessed as daily samples,or
(b) The water segment includes a sampling location that has a median fecal coliform MPN value that exceeds 14 counts per 100 ml for the verified period. To calculate a median value for a sampling location, there shall be at least 20 samples collected during the verified period.
(4) Waters that qualify for placement on the planning list based on shellfish harvesting classification information shall be verified as impaired for fecal coliforms. Specific Authority 403.061, 403.067 FS. Law Implemented 403.062, 403.067 FS. History–New 6-10-02, Amended 12-11-06, 9-4-07.

62-303.500 Prioritization.
(1) When establishing the TMDL development schedule for water segments on the verified list of impaired waters, the Department shall prioritize impaired water segments according to the severity of the impairment and the designated uses of the segment, taking into account the most serious water quality problems; most valuable and threatened resources; and risk to human health and aquatic life. Impaired waters shall be prioritized as high, medium, or low priority.
(2) The following waters shall be designated high priority:
(a) Water segments where the impairment poses a threat to potable water supplies or to human health.
(b) Water segments where the impairment is due to a pollutant regulated by the CWA and the pollutant has contributed to the decline or extirpation of a federally listed threatened or endangered species, as indicated in the Federal Register listing the species.
(3) The following waters shall be designated low priority:

(a) water segments that are listed before 2010 due to fish consumption advisories for mercury (due to the current insufficient understanding of mercury cycling in the environment).
(b) Man-made canals, urban drainage ditches, and other artificial water segments that are listed only due to exceedances of the dissolved oxygen criteria.
(c) Water segments that were not on a planning list of impaired waters, but which were identified as impaired during the second phase of the watershed management approach and were included in the verified list, unless the segment meets the criteria in paragraph (2) for high priority.
(4) All segments not designated high or low priority shall be medium priority and shall be prioritized based on the following factors:
(a) The presence of Outstanding Florida Waters.
(b) The presence of water segments that fail to meet more than one designated use.
(c) The presence of water segments with greater than twenty-five percent of the samples not meeting an applicable water quality criterion or alternative threshold with a minimum of a 90 percent confidence level.
(d) The presence of water segments that exceed more than one applicable water quality criteria.
(e) Administrative needs of the TMDL program, including meeting a TMDL development schedule agreed to with EPA, basin priorities related to following the Department's watershed management approach, and the number of administratively continued permits in the basin..Specific Authority 403.061, 403.067 FS. Law Implemented 403.062, 403.067 FS. History - New 6-10-02, Amended 12-11-06.

62-303.720 Delisting Procedure.
(1) Waters on planning lists developed under this chapter that are verified to not be impaired during development of the verified list shall be removed from the State's planning list. Once a water segment is verified to not be impaired pursuant to Part III of this chapter, the data used to place the water on the planning list shall not be the sole basis for listing that water segment on future planning lists.
(2) Water segments shall be removed from the State's verified list only after completion of a TMDL for all pollutants causing impairment of the segment or upon demonstration that the water meets the water quality standard that was previously established as not being met.
(a) For waters listed due to failure to meet aquatic life use support based on water quality criteria or due to threats to human health based on single sample water quality criteria, the water shall be delisted when:
1. The number of samples that do not meet an applicable water quality criterion due to pollutant discharges is less than or equal to the number listed in Table 4 for the given sample size, with a minimum sample size of 30. Waters shall be delisted when 10% or less of the samples do not meet the applicable criterion with a minimum of a 90% confidence level using a binomial distribution, or
2. Following implementation of pollution control activities that are expected to be sufficient to result in attainment of applicable water quality standards, evaluation of new data indicates the water no longer meets the criteria for listing established in Rule 62-303.420, F.A.C., or
3. Following demonstration that the water was inappropriately listed due to flaws in the original analysis, evaluation of available data indicates the water does not meet the criteria for listing established in Rule 62-303.420, F.A.C. New data evaluated under subparagraph 62-303.720(2)(a)1., F.A.C., must meet the following requirements:
a. They must include samples collected during similar conditions (same seasons and general flow conditions) that the data previously used to determine impairment were collected, with no more than 50% of the samples collected in any one quarter,
b. The sample size must be a minimum of 30 samples, and
c. The data must meet the requirements of subsections 62-303.320(4), (6) and (7),

F.A.C.
(b) For waters listed due to failure to meet aquatic life use support based on biological data, the water shall be delisted when the segment passes two independent follow-up bioassessments and there have been no failed bioassessments for at least one year. The follow-up tests must meet the following requirements:
1. For streams, the new data may be two BioRecons or any combination of BioRecons and SCIs.
2. The bioassessments must be conducted during similar conditions (same seasons and general flow conditions) under which the previous bioassessments used to determine impairment were collected.
3. The data must meet the requirements of subsections 62-303.330(1) and (2), F.A.C.
(c) For waters listed due to fish consumption advisories, the water shall be delisted following the lifting of the advisory or when data complying with paragraphs 62-303.470(1)(a) and (b), F.A.C., demonstrate that the continuation of the advisory is no longer appropriate.
(d) For waters listed due to their shellfish bed management classification, the water shall be delisted upon reclassification of the shellfish harvesting area to approved, or for conditionally approved areas, when the only source identified by SEAS for the harvesting area is wildlife.
(e) For waters listed due to bathing area closure or advisory data, the water shall be delisted if the bathing area does not meet the listing thresholds in subsection 62-303.360(1), F.A.C., for five consecutive years.
(f) For waters listed based on impacts to potable water supplies, the water shall be delisted when applicable water quality criteria are met as defined in paragraph 62-303.380(1)(a), F.A.C., and when the causes resulting in higher treatment costs have been ameliorated.
(g) For waters listed pursuant to paragraph 62-303.460(3)(b), 62-303.470(3)(b), or 62-303.480(3)(b), F.A.C., the water shall be delisted when:
1. The criteria applicable to those sections are met for three consecutive years and there are sufficient new data available to calculate monthly values for at least the same seasons in which the exceedances occurred, or
2. Following a demonstration that the water was inappropriately listed due to flaws in the original analysis, including the use of a non-representative sample set.
(h) For waters listed pursuant to paragraph 62-303.460(3)(a), 62-303.470(3)(a), or 62-303.480 (3)(a), F.A.C., the water shall be delisted upon meeting the delisting provisions in paragraph 62-303.720(2)(a), F.A.C.
(i) For waters listed based on a human health-based annual average criterion, the water shall be delisted when the annual average concentration is less than the criterion for three consecutive years.
(j) For waters listed based on nutrient impairment, the water shall be delisted if it does not meet the listing thresholds in Rule 62-303.450, F.A.C., for three consecutive years.
(k) For any listed water, the water shall be delisted if, following a change in approved analytical procedures, criteria, or water quality standards, evaluation of available data indicates the water no longer meets the applicable criteria for listing.
(l) For waters listed based on paragraph 62-303.420(7)(b) or subsection 62-303.470(3), F.A.C., the water shall be delisted if the Department determines the water is no longer impaired, based on scientifically credible and compelling information comparable in quantity and quality to the information used to make the initial listing decision. Any determinations to delist waters based on this provision shall be documented, and the documentation shall include the basis for the decision.
(m) For waters listed pursuant to paragraph 62-303.320(6)(b), F.A.C., the water shall be delisted when the applicable criteria are met for at least three consecutive years and there are new data available for the same seasons in which the previous exceedances occurred.
(3) Any delisting of waters from the verified list shall be approved by order of

the Secretary at such time as the requirements of this section are met.
Specific Authority 403.061, 403.067 FS. Law Implemented 403.062, 403.067 FS.
History–New 6-10-02, Amended 12-11-06, 9-4-07.