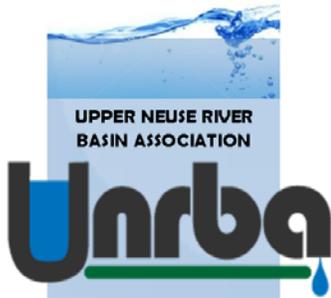


January 16, 2018

To: North Carolina Environmental Management Commission
North Carolina Division of Water Resources
Address: TMDL303dComments@ncdenr.gov

Subject: UNRBA Comments on NC's Draft 2018 303(d) List, 2018 Draft Integrated Report, and 2018 303(d) Listing Methodology



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South Granville Water
and Sewer Authority

Soil and Water
Conservation Districts

I am pleased to offer, on behalf of the UNRBA, the attached comments on North Carolina's Draft 2018 Integrated Report (IR) and 303(d) list. I would like to express grateful appreciation to the NC Environmental Management Commission (EMC) for the opportunity to provide comments on the full set of 303(d) assessments: Draft 303(d) List, Integrated Report (IR) and the new 2018 EMC Listing Methodology. The action to notice all of these documents is to my knowledge the first time the EMC has offered the public this opportunity. I think this decision represents good public policy and will work to provide an improved process for finalization of these important and integrated components of NC's water quality management program. Your efforts to encourage transparency and public participation in these important decisions reflects a strong understanding of how your decisions affect the management of water quality in NC. We appreciate the Commission taking our comments into consideration before making a final decision on the 303(d) list and the IR.

As you know, the UNRBA is focused on the eutrophication management of Falls Lake. The comments provided will focus on Falls Lake but will also include observations and recommendations on other aspects of the documents noticed.

Central to our interests is the compliance status of Falls Lake. The draft IR places Falls Lake in assessment Category 4 because there is a management strategy in place in rule (Falls Lake Rules). These rules were developed with the objective of attaining compliance with the chlorophyll-a water quality standard. In finalizing this assessment, the UNRBA believes it is essential that the IR provide an evaluation of meeting or not meeting the chlorophyll-a standard that is consistent with the Falls Lake Rules. The chlorophyll-a standard compliance determination is a core component of the Rules and the information in the IR must accurately correlate with the compliance provisions of the Rules. Under the two-stage approach, as specified in the Rules, attainment of the chlorophyll-a water quality standard for two consecutive 303(d) assessment cycles is required to confirm compliance. The Rules establish segmentation of the lake for compliance with the standard and require that the 303(d) assessment process use these segments (see 15 NCAC 02B .0275). Therefore, it is essential that there be agreement between how the Falls Lake Rules determine compliance and how the EMC assesses compliance with the chlorophyll-a standard under 303(d). This means the segmentation of the lake must reflect the provisions of the Falls Lake Rules.

The UNRBA is offering detailed comments with supporting explanations but I am also providing a condensed list of our four principal comments on the draft 303(d) products below:

1. The new 2018 methods for numerical assessment makes it easier for waters to be placed on the impaired list and more difficult to justify removal from the list. The 2018 methodology eclipses the requirement for a 90% statistical confidence in determining non-attainment of the water quality standard. The EMC should revise the methodology and only place waters on the impaired list if numerical evaluations support a binomial statistical significance of 90% or greater.
2. The 2018 EMC 303(d) Methodology should be revised with a procedure for the consistent assignment of Water Quality Assessment Units. The UNRBA recommends and urges that Falls Lake AU's be consistently applied. AU's should be independent of individual parameter concentrations and based on a priori knowledge including morphometric, and limnologic features consistent with EPA guidance. Falls Lake, unlike most of NC's waterbodies, has an exceptionally robust monitoring of water quality variables. The availability of the combined water quality monitoring programs of the UNRBA, NCSU CAAE, City of Durham, City of Raleigh, and the NC DWR has created an expansive water quality database for Falls Lake. This data richness represents a significant investment by the UNRBA and provides a tremendous opportunity to properly assess Falls Lake consistent with the Falls Lake Rules. The segmentation approach used in the 303(d) assessment is not consistent with the Falls Rules and establishes a conflicting set of AU's that makes compliance determinations extremely difficult. The 2018 AU's are problematic as compared to the legally adopted assessment description in the Rules. The IR should reflect an appropriate assessment of chlorophyll-a compliance.
3. The 2018 EMC 303(d) Methodology should be revised and should not expand the assessment period from five years to ten years for small data sets to achieve a minimum sample size of 10. This approach only provides potential for listing waters on the basis of outdated data. Where data sets are too small in the standard 5-year assessment period older data should be considered (which is consistent with EPA guidance), but rather than extending the assessment period an additional five years, the DWR should instead establish new monitoring priorities for obtaining additional new data to supplement small data sets for waters suspected of potential impairment conditions.
4. The EMC should maintain method consistency and adopt the 303(d) numerical methodology established for the 2014 and 2016 listing cycle. The 2018 303(d) Methodology for evaluating numerical data is an unnecessarily complex decision tree that implies a more detailed evaluation process, but in reality, reduces the statistical confidence to levels that are not reasonable for making important water quality decisions. A confidence threshold of 90% for listing waters as impaired is a much stronger approach to identifying waters that require specific regulatory action.

The State's standards compliance assessment methodology does need to be evaluated periodically, but that evaluation should reflect the improvements in the science of water quality measurement and the limitations of the information available. North Carolina's Water Quality Standards were first developed in the 1950's. Since that time, water quality science, laboratory analytical capabilities, and other technological advances have dramatically improved. These advances in water quality assessment tools have also been accompanied by programmatic changes expanding regulatory attention beyond point sources to non-point sources. This has resulted in more comprehensive regulatory strategies to address water quality issues in NC and represents significant challenges in managing these sources. Our ability to control non-point sources is still evolving. The Falls Lake Rules are the prime example of this shift relative to nutrient management and include a broad spectrum of extensive requirements related to rainfall-runoff loading from existing development. The rules require the most restrictive reductions in nutrients from non-point sources in the watershed ever

developed in NC and represent some of the most stringent requirements anywhere in the country. Our ongoing evaluation of technologies and practices available to reduce nutrients from non-point sources indicates it will not be possible to meet the reduction requirements using stormwater retrofits on existing development. The limited retrofit technologies available to offset existing nutrient loading and the lack of opportunities in the Falls watershed to install retrofit systems support this evaluation. The economic resources required to reduce nutrients to the levels required in Stage II of the rules are staggering. The EMC methodology applied in the 303(d) and Integrated Reports are now used as the basis of measuring the success of implementation of the Falls Lake Nutrient Management Strategy. It is this methodology that determines regulatory compliance in the watershed. The EMC assessment methodology should prioritize the attainment of actual designated uses over the minor infractions of numerical standards. Where established and adopted rules are in place, these legal requirements should be a primary driver for establishing assessment decisions, including both methodology and waterbody assessment unit determinations.

The UNRBA has consistently acknowledged the importance of managing both point and nonpoint sources of nutrients for maintaining and improving the water quality of Falls Lake. Since the lake was constructed, portions of Falls Lake have experienced monitored exceedances of the NC's chlorophyll-a water quality standard. Fortunately, Falls Lake has not experienced any significant impacts to the lake's designated uses. Relative to better reflecting the relationship between chlorophyll-a and designated uses, NC has embarked on a strategy for modernizing its water quality standards for nutrient management under the NC Nutrient Criteria Development Plan (NCDP). The goal of the plan is to develop scientifically defensible criteria based primarily on the linkage between biological response measurements—chlorophyll-a, nutrient concentrations and protection of designated uses. NC DWR has appointed a Scientific Advisory Council (SAC) to offer recommendations to accomplish this goal. Recent SAC deliberations have indicated that they favor moving away from the single point, single value approach to measuring compliance and are instead recommending an averaging of chlorophyll-a as a more scientifically-based measure of waterbody trophic status. Further, the NCDP also identifies site-specific standards as a preferred approach to responding to eutrophication concerns. The UNRBA has recommended that the EMC explicitly include a site-specific provision in the Water Quality Standards readoption process currently underway.

In March of 2018, the EMC modified the previous (2016) water quality standards assessment methodology. Based on our review, the new method for numerical assessment makes it easier for waters to be placed on the impaired list and more difficult to demonstrate that a water should be taken off the list. We have attached detailed comments supporting this conclusion with additional detail on our review of the Draft 2018 303(d) process and the Draft 2018 IR.

Our local governments want to achieve improved water quality in Falls Lake by applying scientifically supportable, technically feasible and economically achievable actions to balance the level of investment with the level of water quality improvement and protection of designated uses. Accordingly, the UNRBA has invested the resources necessary to perform a re-examination of the efficacy of the current Falls Lake rules. The UNRBA members are proceeding with implementing New Development requirements and Stage I of the Falls' Rules. The information the UNRBA has developed, as well as that provided by the Watershed Oversight Committee, indicates that the actions of the regulated community in the watershed have met and, in some cases, exceeded the overall Stage

I reduction goals. The regulated community is working constructively and collaboratively with the EMC, DWR, and DEQ.

The UNRBA has invested significant resources reviewing the Falls Lake water quality data used to generate the 2018 Integrated Report (2012-2016). During this review, with the assistance of DWR's Assessment Unit Fact Sheets, we have detected a number of data accounting issues that need to be addressed. These technical issues have been forwarded directly to DWR staff and discussions with them have noted the need to make appropriate adjustments. We are confident that our cooperative collaboration with DWR staff will result in these minor issues being corrected.

Further, we request that the EMC review the policy of the DWR for establishing and modifying Assessment Units (AU) because the spatial extent of an AU can be the prime factor in attainment or non-attainment of water quality standards. The EMC should ensure that the DWR Assessment Unit policy is not in conflict with the prohibition in N.C. Gen. Stat. § 150B-18 that bars an agency from the implementation or enforcement of a policy that meets the definition of a rule as contained in N.C. Gen. Stat. §150B-2(8a). The definition of a rule includes an agency standard or statement of general applicability that implements an enactment of the General Assembly or Congress or a regulation adopted by a federal agency or that describes the procedure or practice requirements of an agency. The UNRBA understands and concludes that the proposed policy fits within that definition.

Thank you again for the opportunity to provide comments. If you have any questions, please contact Mr. Forrest Westall, UNRBA Executive Director. We would welcome the opportunity to discuss our comments with you.

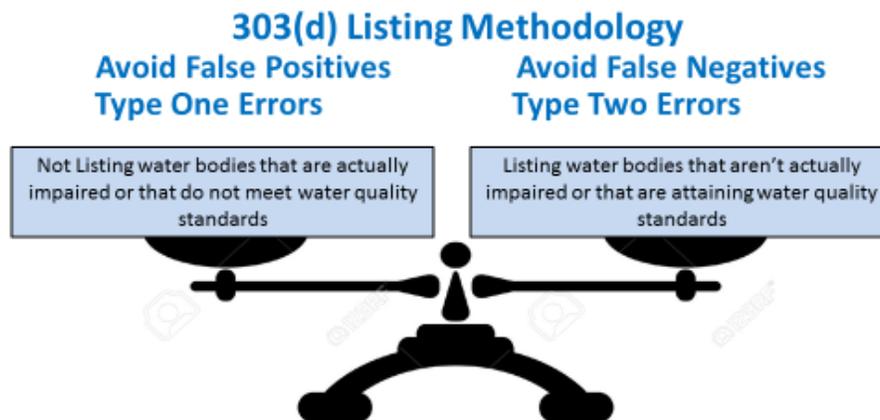
Sincerely,

Original on file
and Signed By

Sig Hutchinson, Chairman
Board of Directors

**UNRBA Comments Concerning November 16, 2018 Public Notice:
State of North Carolina Division of Water Resources (DWR) Public Notice of Availability
of the DRAFT 2018 303(d) list and Integrated Report**

1. The new 2018 methods for numerical assessment make it easier for waters to be placed on the impaired list and will make it more difficult to justify de-listing waters from the 303(d) list. The 2018 methodology functionally removes the previous requirement for a 90% statistical confidence in determining non-attainment of the water quality standards. The EMC should revise the methodology and only place waters on the impaired list if numerical evaluations support a binomial statistical significance of 90% or greater. The 2018 EMC 303(d) Methodology has created an imbalance of potential errors and has skewed the process to favor listing impaired waters. Water bodies that are impaired for their designated uses or in non-attainment of numerical water quality standards should be placed in Category 4 or 5 of the 303(d) list or Integrated Report- but only if there is a high degree of confidence in the numerical assessment. The method of listing and delisting of waters should balance the probability of making listing errors with the clear recognition that the assessment process is repeated every two years. The consequences of the 303(d) decisions on our communities and on our local governments make it absolutely essential that the regulatory agencies and regulated entities alike have a high degree of confidence that actual water quality problems exist (and are not temporary) and that waters are removed from the list when water quality improvements are made. These 303(d) decisions require that comprehensive, often technically difficult, and in many cases costly actions are undertaken to address listed waters. Where these actions are appropriate, it is important to undertake regulatory action. However, there should be a high degree of certainty that a water is impaired before these actions are implemented.



The uncertainty of confidently making standards attainment decisions can be reduced with additional targeted monitoring and re-assessment every two years. Type One errors can be minimized with this approach if the methodology is not skewed towards listing waters. The 2018 methodology reduces this balance by diminishing the requirement for a 90% binomial statistical confidence based on the number of samples collected. The 2018 EMC methodology allows waters to be listed without 90% confidence if 4 excursions have occurred in the last two years as provided in the example below:

Number of Observations	Number Obs > Standard	% observations >Standard	% Confidence Exceeded	# Excursions Last two years	2018 Methodology Status
50	6	12%	62%	4	Impaired

The 2018 methodology results in an approach that doesn't require a 90% statistical confidence in determining non-attainment of the water quality standards. The 2018 approach diminishes the importance of a 5 year assessment and prioritizes the most recent 2 years – which conveys a temporary perspective. When applied to waters previously found on the 2016 list, the new 2018 methodology increases this approach towards listing even further as provided in the example below when only 2 excursions occurred in the last two years.

Number of Observations	Number Obs > Standard	% observations >Standard	% Confidence Exceeded	# Excursions Last two years	2018 Methodology Status
50	6	12%	62%	2	Impaired

The assessment period covers 5 years – there is no justification offered for skewing decisions based on the 2 most recent years. Data sets are generally very small, as in the above example, less than 3% of the time period (50 days out of 1825 days -5 years). There is no justification to skew this assessment towards listing based only on the last two years – which further reduces the sample size. The 2018 methodology no longer requires a binomial statistical confidence of 90% before waters are placed on the list.

2. The 2018 EMC 303(d) Methodology should be revised with a procedure for the consistent assignment of Water Quality Assessment Units. The UNRBA recommends and urges that Falls Lake AU's should be consistently applied, independent of individual parameter concentrations and based on a priori knowledge - morphometric, and limnologic features consistent with EPA guidance and more consistent with the Falls Lake Rules. Falls Lake, unlike most of NC's waterbodies, has an exceptionally robust assessment of water quality variables. Combined water quality monitoring activities of the UNRBA, NCSU CAAE, City of Durham, City of Raleigh, and the NC DWR has created a uniquely robust data set for Falls Lake. This data richness in combination with the conflicting segmentation approach of the Falls Rules establishes sound reasoning for modification of the proposed AU's in the Draft 2018 IR. The current DWR approach of changing AU's based on the highly variable concentration of parameters (# of exceedances) skews the process in favor of impairing waters without any confirmation of impairment to actual designated uses. The overall assessment of waterbodies must be based on looking at scientifically-valid, realistic and consistent segmentation of the waters. Assessments Units (AU's) are segments of streams, lakes, or estuaries where monitoring station attainment or excursions may be consolidated from different stations in order to provide a representative perspective with a larger sample size of the waterbody. Determining the spatial extent of an AU can be the prime factor in attainment or non-attainment of water quality standards because it determines what monitoring data is reviewed for the AU. If every station in an AU is evaluated independently to determine impairment, that is not a reasonable, representative, scientific, decision process. Water quality numerical standards were adopted considering representative sampling. Representative sampling (although not specifically defined) is acknowledged as important in 15A NCAC 02B.

Representative sampling using multiple locations is particularly important for large, slow-moving waterbodies where cross sectional locations demonstrate the high variability of the waterbody. Unlike many other states, DWR's current approach is to evaluate water quality monitoring stations independently. If there are multiple stations in one assessment unit and one station has observed exceedance frequencies of a parameter different from the others (i.e. one could be considered impaired and the others not impaired) then the AU is split into two or more AU's. This approach tends to increase the number of AU's over time and reduces the number of stations included within a particular AU. AU's can also be split or added because new stations have been added. The rules are very clear - Uses are protected through the appropriate establishment of Stream Classifications. Classifications determine the appropriate Water Quality Standards. Unlike the relatively stable stream classifications, DWR changes AU's, not based on classifications, geo-referencing, or morphology, but on the variability of monitoring data for each assessment period – i.e. if individual locations can be assessed as impaired the AU's are changed to accommodate impairment decisions. This moving target (changing Assessment Units) is particularly important for Reservoirs and Estuaries. The result is a one-way change that results in decisions that maximize the number of 303(d) listings. The Falls Lake 303(d) listing process is a dramatic example of this approach and has made determination of compliance with the Falls Lake Rules unnecessarily complicated and inconsistent with the Rules. The 2008 assessment cycle divided Falls Lake into only two AU's. The entire Falls Lake was determined to be impaired for chlorophyll-a based on the evaluation. Every station was not independently evaluated. The entire lake was determined to be impaired even though none of the monitoring locations in the lower lake exceeded the 10% exceedance threshold. Since the 2008 assessment, the number of AU's has increased incrementally to 11 segments in the 2018 Draft IR. Changing AU's based on concentration data from an individual station is not consistent with EPA guidance nor is it consistent with the Falls Lake Nutrient Management Strategy.

Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act (IRG). Page 47

<https://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf>

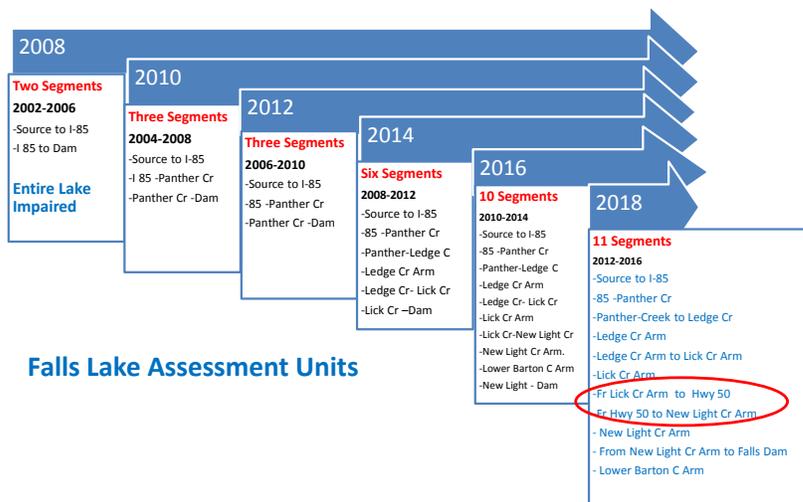
From the EPA Guidance: "Using NHD or other comparable GIS framework, a state should assign a discrete "address" or geo-location to each segment, and document the process used for defining water segments in their methodologies. The physical boundaries (beginning and end points) of a segment should be defined in such a manner that a scientifically valid assessment of each and every segment can be made. The individual size of a segment will vary based upon methodologies. Segments should, however, be larger than a sampling station but small enough to represent a relatively homogenous parcel of water (with regard to hydrology, land use influences, point and nonpoint source loadings, etc.)."

The current AU division of Falls Lake is not appropriate and results in difficult and often contradictory regulation decisions. The end result is that the central tendency of a classified water body is not used to evaluate impairment. A central tendency evaluation of eutrophication concerns is much more scientifically valid than the single-point, single-value approach that DWR is currently using. A central tendency approach using all the stations within an AU is appropriate for chlorophyll-a, and other nutrient related variables, particularly in lakes, reservoirs, large slow-moving waterbodies and estuaries. This is important because chlorophyll-a is a general indication of trophic status and algal productivity, is variable from site to site, even on the same day and with samples taken in close proximity at the same time. It is much more indicative of general trophic health to use multiple stations within an AU. At a minimum, AU's should be established based on morphology and sound limnological evaluation as described in

the EPA guidance included above. All of the stations within that AU should be evaluated collectively representing the AU. Furthermore, even pristine waterbodies or those that have relatively undeveloped watersheds can have elevated chlorophyll-a values and exhibit chlorophyll-a levels that exceed the current standard. Management strategies for reducing the potential of unacceptable eutrophication impacts may take decades to accomplish. Thus, frequent changes to AU's based on dynamic changes in parameter concentrations unnecessarily confuses decisions on impairment and further complicates developing consistent regulations, management strategies, and compliance end-point decisions. The current AU approach based on assessment of single stations and then splitting out individual stations that could be impaired results in regulatory decisions that are biased and overly restrictive and greatly diminish the regulated communities understanding and support for management action. For example, the 2018 Draft IR, based on this current methodology, split Falls Lake AU 27-(5.5)b4b into two distinct segments:

27-(5.5)b4b1 Impaired – not meeting the 40ug/L chlorophyll-a criteria
 27-(5.5)b4b2 Not Impaired and is meeting the 40ug/L chlorophyll-a criteria

Each of these two new AU's contain only one station. These locations are approximately 0.25 miles apart. It is inappropriate to split this AU simply to impair station FL50C. It has not been determined if differences in these results can be attributed to differences in the quality of the datasets. If locations NEU019E and FL50C were retained in the same assessment unit the result would be 231 observations with 28 exceeding for 12% and 83% confidence. There were no samples exceeding in the time period 2015-2016 thus the combined locations would yield an assessment of category 3b.



While AU guidance can be interpreted with some variability, the UNRBA supports the guidance provided by the Environmental Protection Agency* in 2006 on the establishment of Assessment Units:

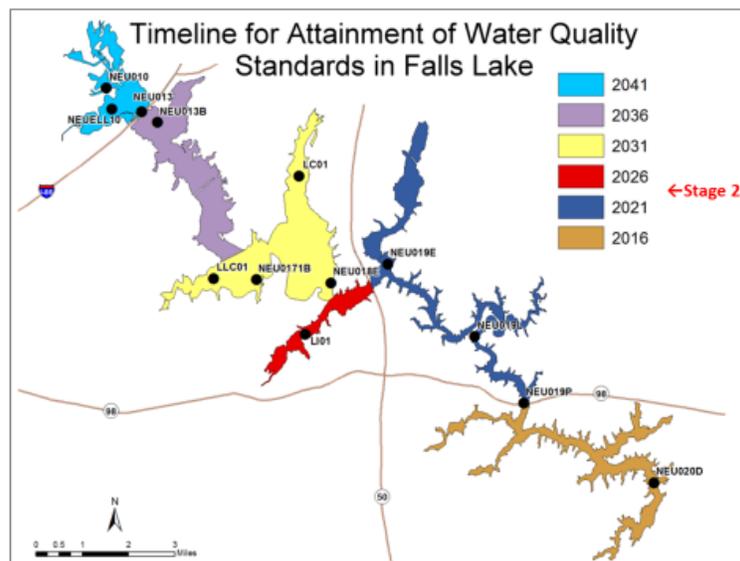
- AU's should be consistent using a rational segmentation and geo-referencing approach.
- AU's should represent homogeneity in physical, biological or chemical conditions.

- AU's should reflect an *a priori* knowledge of factors such as flow, channel morphology, substrate, riparian condition, adjoining land uses, confluence with other waterbodies, and potential sources of pollutant loadings (both point and nonpoint).
- AU's should be larger than a sampling station but small enough to represent a relatively homogenous parcel of water (with regard to hydrology, land use influences, point and nonpoint source loadings).

*See: Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act (IRG). Page 47 -

<https://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf>

In contrast to the overly divided 11 AU segments found in the Draft 2018 IR, the Falls Rules, designed to attain the chlorophyll-a water quality standard, divided the lake into 6 consistent assessment units as depicted below. The UNRBA recommends and urges that Falls Lake AU's should be consistently applied, independent of individual parameter concentrations and based on *a priori* knowledge, morphometric, and limnologic features consistent with EPA guidance. In this manner, individual monitoring stations within an AU can each contribute information and data to a larger sample size more representative of the central tendency of the AU. The current approach of delineating AU's may be appropriate for small, free-flowing streams and rivers because monitoring stations are rarely in close proximity on the same water body. However, applying the current DWR AU delineation process based on individual stations alone is not appropriate for Falls Lake - one of the most heavily monitored lakes in the country. In regard to the data richness of Falls Lake, the current AU assignment process actually discourages the collection of more data both within the lake and elsewhere. The DWR and the EMC are encouraged to avoid a "one-size-fits-all" approach in the assignment of AU's for streams, rivers, lakes, reservoirs, and estuaries based on individual station evaluations. This approach is not valid for lakes, reservoirs and estuaries where more data is available and is clearly inappropriate for Falls Lake. AU's need to be based on the principles identified and advocated in these comments.



3. The 2018 EMC 303(d) Methodology should be changed and should not expand the assessment period from five years to ten years for small data sets to achieve a minimum sample size of 10. This approach only provides potential for listing waters on the basis of outdated data. Rather, the DWR should consider the older data in making a decision to establish additional monitoring priorities for obtaining new data to supplement any small data sets suspected of potential impairment conditions.

As indicated earlier, Falls Lake has a robust data set and small samples sizes are not usually encountered. However, the UNRBA is very concerned with this change in methodology.

Expanding the assessment period to ten years diminishes the representativeness of the sample size. Expanding the assessment period to ten years (in order to obtain 10 samples) is counter to both scientific and statistical practices. Hindcasting for data outside of the assessment period is not justified. If there are five observations of chlorophyll-a within a five year assessment period your sample size is equal to a representation of five days out of 1,825 days or far less than 1%. Similarly, if you have ten observations of chlorophyll-a within a 10 year assessment period your sample size is equal to a representation of ten days out of 3,650 days, again far less than 1%.

Number of Samples	Assessment Period	Days in Assessment Period	% of Number of days Sampled
5	5 years	1825	0.27%
10	10 years	3650	0.27%

Expanding the Assessment Period for small data sets does not increase the representativeness of the water quality data used for assessment for numerical standards. Expanding the review period to ten years for small data sets in order to obtain 10 samples biases the process toward older data, in either impairing the waters or determining the waters should not be impaired. The conclusion is that small sample sets of numerical standards do not provide an adequate basis for representativeness or confident decisions to impair waters. This lookback approach provides another opportunity to skew the listing process in favor of impairing waters based on expanding the assessment period rather than identifying priorities for additional sampling evaluations. Small data sets with some consideration of older data should be used for screening purposes and for identifying future monitoring priorities.

The UNRBA acknowledges that the 2018 methodology will require a minimum of three exceedances in the current data set (5 years) for inclusion on the 303(d) list. But this also is not a statistically confident binomial approach based on sample size. Rather it could result in a water quality impairment simply because a low flow situation or an abnormal weather period caused the issue and not an actual source-impairment of water quality. Every effort should be made to expand monitoring of these sites of concern to produce an appropriate five-year assessment period. Representative future sampling is a much more reasonable response to these small dataset stations than expanding the period to ten years and requiring 3 exceedances in the current five-year period.

4. The EMC should maintain method consistency and apply the 303(d) numerical methodology established for the 2014 and 2016 listing cycle. The 2018 EMC 303(d) Methodology for evaluating numerical data represents an unnecessarily complex decision tree that implies better evaluations, but in reality, weakens the confidence threshold to well below the 90% used in 2014 and 2016 to list waters as impaired. The UNRBA believes that an assessment methodology that relies on a binomial statistical confidence of 90% is a much better approach than applying an “override” of a few exceedances observed only in the last two years of the assessment. Statistical tests are important because they take sample size into consideration in determining the weight of evidence that a water body is impaired.

The UNRBA has reviewed several possible pathways of numerical data assessments using the 2018 303(d) listing methodology. As indicated in the table below, it is our conclusion that the new methodology will result in a much diminished level of confidence in the impairment decision making. Waters that are impaired trigger important and in many cases comprehensive regulatory action. It is reasonable to require a 90% statistical confidence before listing waters. The revised approach for 2018 does not adequately recognize the importance of sample size in the assessment. Nor does it adequately consider duration, frequency, magnitude, and severity. This provision of the 2018 Methodology does not recognize that even pristine or relatively un-impacted waters can occasionally exhibit elevated or poor monitoring results due to extreme weather events or other natural conditions. The 5 year assessment period represents 1825 days and even with monthly sampling (60 samples) the sample size represents only 3% of the period. Accordingly, there is considerable uncertainty in determining whether waters are/are not meeting standards.

Method Year	Listing Method	Years	Days	# Samples Minimum	Actual # Samples	#Samples > Criteria	% > Criteria	Exceeding Confidence Binomial	303(d) Result	Listing Category
2012	>10%	5	1825	10	10	2	20%	N/A	listed	4 or 5
2102	>10%	5	1825	10	60	7	12%	N/A	listed	4 or 5
2014 & 2016	>10% +90% confidence exceeding	5	1825	10	10	2	20%	74%	not listed	3
2014 & 2016	>10% +90% confidence exceeding	5	1825	10	60	7	12%	60%	not listed	3
2018	>10% + <90% confidence exceeding + 4 obs>in last two years	5	1825	10	10	2	20%	74%	listed**	4 or 5
2018	>10% + <90% confidence exceeding + 4 obs> in last two years	5	1825	10	60	7	12%	60%	listed*	4 or 5

** On 2016 list and two of the samples observed exceeded in last two years

* Not on 2016 list but four of the seven samples observed exceeded in last two years