EVALUATION OF NUTRIENT CRITERIA ADOPTION ON COLORADO MUNICIPAL AND COMMERCIAL INTERESTS

PREPARED FOR COLORADO NUTRIENTS COALITION

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EXECUTIVE SUMMARY

EVALUATION OF NUTRIENT CRITERIA ADOPTION ON COLORADO MUNICIPAL AND COMMERCIAL INTERESTS

Under great pressure and significant funding from EPA, Colorado is preparing to propose in 2011 extremely stringent numeric water quality standards for Total Nitrogen (TN) and Total Phosphorus (TP). These new nutrient standards will be applicable to both lakes and streams. The standards are so low (TN in particular) that all waters below urban and agricultural areas will be declared nutrient impaired. Even areas with little or no human development may have difficulty meeting the proposed objective. Field data confirm that little or no assimilative capacity will exist in any state waters if the proposed standards are adopted. This means highly restrictive nutrient load limitations will be placed on all nutrient sources and restrictions on future growth will likely be mandated. Compliance with these standards will result in broad impacts on municipal, industrial, agricultural, urban and related water supply activities throughout the state. Compliance costs for all activities are roughly estimated to be in the $5-10 billion range. The following specific impacts are anticipated under the federal Clean Water Act.

Municipal and commercial dischargers will need to add biological nutrient removal along with chemical addition and filtration treatment technology for both TP and TN and, eventually, reverse osmosis to attain the low TN standards. Use of reverse osmosis will greatly reduce the amount of water available to downstream users and will significantly increase electrical demands. Disposal of toxic brine will need to occur if membrane technology is used.

Municipal stormwater controls will likely require capture of runoff and treatment because best management practices typically employed to reduce stormwater pollutants will be insufficient to achieve the degree of pollutant removal that will be required. Stormwater capture will also decrease downstream water availability. Agricultural operations, particularly those receiving federal subsidies, will be under pressure to implement grass filter strips, setbacks, buffers, fencing, manure management, animal waste storage, and liquid waste management. In similar circumstances, other states and federal programs have initiated adoption of very proscriptive requirements to reduce nutrient impairments originating from agricultural operations.

Even water transfers and water management of water rights are anticipated to be impacted by the proposed nutrient standard adoption. Although largely exempt from NPDES permitting under the current federal “Water Transfer Rule,” that rule is narrowly defined and presumes that transfer-related impacts will be managed by state authorities. Movement of nutrient laden waters from ditches, canals and reservoirs that are not “Waters of the US” to streams that are “Waters of the US” is presently subject to permitting and imposition of nutrient removal requirements.

Where stringent nutrient standards are not being attained, the Total Maximum Daily Load (TMDL) processes must be initiated to identify the allowable nutrient load that will achieve the applicable standards. Pursuant to existing federal rules, load reductions must be achieved before new sources may be allowed to discharge. Moratoriums on urban growth and new commercial operations are a threat once waters are identified as impaired. Such restrictions have been imposed under applicable federal rules governing this situation. Point sources may have to implement non-point source reductions to avoid moratoriums.

With such widespread social and economic consequences, setting nutrient standards must be done correctly and precisely. Water quality standards are required to be set at the level "necessary to protect uses." This requires that a clear "cause and effect" relationship be documented between the pollutant of concern and likely use impairments for different classes of waters. State programs have encountered severe problems in making this demonstration for nutrients, since the effects are highly variable. At EPA's suggestion, the Division employed a simplified statistical method to identify numeric standards. The problem, however, is that these simplified methods presume, but do not demonstrate, that elevated levels of nutrients will cause impairments in any water where they occur. Historically, the Division focused its efforts on TP reduction, but at EPA's urging, included extremely restrictive TN standards even though it is not apparent that regulating this parameter will have any beneficial effects.

On April 27, 2010, EPA's Science Advisory Board ("SAB") issued a report highly critical of the simplified statistical methods being used to generate these preliminary nutrient criteria. The SAB found these procedures inadequate for developing scientifically defensible criteria because they lack a "cause and effect" demonstration. The SAB was clear that without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels will lead to the desired outcomes. The SAB reiterated that legitimate criteria development methods must include consideration of the physical and biological factors that decrease or preclude excessive plant growth in many situations, and focus on the nutrient that is actually controlling plant growth. These factors include habitat conditions such as canopy coverage precluding sunlight, hydrology, velocity, abrasive sediment movement, algae grazer abundance, as well as considerations of nutrient concentrations in unit of time or loading over longer time periods.

The Division proposed initial nutrient standards for discussion for Lakes and Reservoirs in 2009, and for Rivers and Streams in 2010. The initial nutrient proposals will be further discussed in September, October, and November 2010, but meetings in June, July and August will likely define the scope of these future discussions. The Proposal for Rulemaking will be issued February 2011 and Rulemaking to adopt the Proposal as Table Value Standards will be June 2011. To effectively participate in upcoming Division Work Group meetings and, hopefully, obtain the Division's concurrence that an alterative approach would be more appropriate for Colorado waters, a broad-based coalition is being formed to finance regulatory and scientific expertise. Future actions will be directed at the following key concerns:

1. Deferral of Total Nitrogen as an unnecessary state standard, since Total Phosphorus is typically the limiting nutrient in fresh waters.

2. Development of a state policy for site-specific stream standard adoption based on documented evidence of nutrients impairment.

3. Use of site-specific reservoir standards to protect specific uses and to ensure water usage goals are properly considered.

4. Adoption of a state policy on pre-TMDL permitting to limit imposition of growth moratoriums while necessary control requirements are identified.

5. Development of a state policy to utilize pollutant trading programs for implementing more cost-effective measures and to enable new facilities to be permitted pending TMDL completion.

6. Development of a state water transfer policy addressing when such transfers will be subject to management measures, before other more stringent NPDES requirements are considered.

The purpose of this White Paper is to review how the establishment of nutrient criteria and the need to ensure compliance with these objectives may result in broad impacts on municipal, industrial, agricultural and related water supply activities throughout the state. This analysis is intended to (1) outline the legal requirements associated with the criteria adoption/impaired waters designations, (2) evaluate the technical merits of the proposed criteria, and (3) present a possible strategy to minimize unnecessary adverse social and economic impacts while attaining applicable environmental goals.

I. BACKGROUND

Nitrogen and phosphorus are essential nutrients for life on earth. However, too much nitrogen or phosphorus in lakes, reservoirs, streams and rivers can cause excessive plant growth that reduces the dissolved oxygen in the water sufficiently to impair fishery resources. Excessive algal growth also causes distasteful drinking water. Nutrients can accumulate over time in sediments of lakes and reservoirs and ultimately recycle back, posing a long-term water quality problem that is difficult to manage.

Nutrients are not toxics that have a threshold above which adverse impacts are certain to occur. Physical factors, such as sunlight, water velocity, turbidity, substrate, presence of zooplankton and other biological factors may prevent excessive plant growth even when high nutrient concentrations occur. This is what makes setting nutrients standards a very difficult process. Due to the many factors affecting whether or not nutrient levels will trigger excessive plant growth, the Association of State and Interstate Water Pollution Control Administrators (“ASIWPCA”), in June 2007, informed EPA that attempting to establish statewide nutrient objectives was not technically defensible:

> *During their considerable development processes, many States are failing to find a strong linkage between the EPA recommended cause variables (N and P) and response variables of chlorophyll-a and transparency, but are finding wide variations in parameters that seem unrelated to professional assessments of ‘‘trophic health’’ status. In many cases, a relationship cannot be demonstrated between causal variables N and P, and factors such as turbidity, light limitation, canopy cover, substrate, aquatic community structure, bioavailability, reservoir sequestration, micronutrient limitations and other ‘‘response’’ variables. These problems can only lead to mis-cues in impairment identification and mis-direction of scarce management and implementation resources.*
>
> Letter from ASIWPCA to Ben Grumbles (EPA AA Water)
> (July 18, 2007); *http://www.asiwpca.org/home/docs/Ltr2EPANutrients.pd*

The complexity of this issue was anticipated by EPA many years earlier:

> *“Algal growth typically is greatly reduced or negligible during the winter low light and temperatures; it then usually increases during the spring under increasing sunlight… Nutrients might not always be the limiting factor controlling nuisance plant growth. Several other constraints, such as light availability, flow,*

> *availability of trace elements, substrate conditions, management (CuSO4+, grazing, and temperature) potentially could be limiting." See Protocol for Developing Nutrient TMDLs*, First Edition, Page 3 –5, 6 (EPA 841-B-99-007).

Presently, Colorado has no Table Value Standards for total nitrogen ("TN") or total phosphorus ("TP") that will serve as benchmarks for protecting aquatic life, recreation, or drinking water uses. Since 1984 Colorado has set TP standards on select reservoirs on a site-specific basis to protect these uses. Despite that effective process, EPA expects all states to adopt numeric nutrient standards for all waters, and, in response, the Water Quality Control Division ("Division") is intending to adopt Table Value Standards in June 2011. It is the Division's proposed initial standards that are the subject of this paper's detailed technical and regulatory review.

Those suggested standards are so low that municipal wastewater effluents will be reduced from current TP levels of 4-7 mg/l down to something in the range of 0.1 mg/l or less. This will require the addition of biological nutrient removal technology along with chemical flocculation and filtration to further remove phosphorus. This is an expensive, chemical- intensive treatment process. Furthermore, TN in POTW effluent will have to be reduced from about 20-40 mg/l down to a range of less than or equal to 1.0 mg/l. TN removal will require additional treatment systems which are also very expensive to construct and often energy intensive to operate. To meet limitations less than 3 to 5 mg/l will likely require use of reverse osmosis, the most expensive and energy intensive form of treatment that also produces a toxic side stream requiring additional disposal. Because the costs of treatment are anticipated to be extremely high and have major ramifications on water reuse, public policy should assure that the adopted standards are set at the level truly necessary and appropriate.

Water quality standards are required to be set at the level "necessary to protect uses." 40 CFR 131.2. In general this requires that a clear "cause and effect" relationship to use impairment be documented for different classes of waters and various uses. As noted earlier, state programs have encountered severe problems in making this demonstration for nutrients, and, at EPA's suggestion, have begun to use more simplified statistical methods to identify numeric standards. These simplified methods presume, but do not demonstrate, that elevated levels of nutrients are the cause of impairments in any water where they may occur. This assumption is directly at odds with decades of nutrient research and EPA-published technical guidance which has repeatedly affirmed that nutrients do not cause impairments in many situations, since other factors may also control plant growth.

On April 27, 2010, EPA's Science Advisory Board ("SAB") issued a report highly critical of the "statistical" methods being used to generate nutrient criteria and found these procedures inadequate for developing scientifically defensible criteria because they lack a "cause and effect" demonstration.[1] These are the same types of procedures that Colorado has used to identify its preliminary stream standards. To a certainty,

[1] See, SAB Ecological Processes and Effects Committee Review of Empirical Approaches for Nutrient Criteria Derivation. (April 27, 2010).

application of these criteria will lead to substantial municipal and private expenditures unrelated to actual environmental need if they are not tailored to site-specific conditions. The purpose of this White Paper is to review the environmental ramifications of adopting both TN and TP criteria as suggested by the Division.

II. OVERVIEW OF THE WATER QUALITY CONTROL DIVISION'S INITIAL PROPOSALS

A. The Draft Nutrient Criteria Proposals

As of August 2009, the Division has suggested the following nutrient standards for Lakes and Reservoirs:

Use Classification	TP	TN	CHLa
Cold Water Biota	0.024 mg/l	0.490 mg/l	8 ug/l
Warm Water Biota	0.082 mg/l	0.960 mg/l	20 ug/l

As of February 2010, the Rivers and Streams initial proposal is:

Cold Water Biota	0.090 mg/l	0.824 mg/l
Warm Water Biota	0.135 mg/l	1.316 mg/l

The primary purpose of the lake objectives is to protect aquatic life uses, as well as swimming and recreation uses. These values would apply to all standing surface waters regardless of size (*e.g.*, golf course ponds and watering holes are also covered) or actual usage (*e.g.*, agricultural water supply). The stream standards are intended to protect insect life, as measured by the Multi Metric Index ("MMI"). A more detailed discussion of how these numeric criteria were derived follows.

The chlorophyll 'a' values suggested by the Division to protect specific uses are:

USE	CHL 'A' OBJECTIVE	EXCEEDANCE FREQUENCY
Fishery-Warm	20 ug/l	1 in 5 years
Fishery-Cold	8 ug/l	1 in 5 years
Recreation-Warm	30 ug/l	<15% if summer avg < 20 ug/l
Recreation-Cold	20 ug/l	1 day if avg < 8ug/l
Disinfection By-Products Protection	5 ug/l	TBD
Taste and Odor Protection	10 ug/l	TBD

While there are no specific guidelines on drinking water protection, the Division has suggested that drinking water protection may require far more restrictive chlorophyll "a" concentrations, than that needed to protect aquatic life or swimming uses. The suggested 5 ug/l chlorophyll 'a' value would correlate to a TP standard of about 0.011 mg/l in the Division's methodology. This chlorophyll 'a' value is based on a presumed relationship between plant growth levels and the degree of dissolved organic matter present in a water supply. The type of drinking water treatment used also affects the desired chlorophyll "a" level because certain processes are designed to remove dissolved carbon and certain disinfection processes minimize trihalomethane formation. Thus, site-specific information must be used to determine whether this relationship actually exists or whether the issue of concern is manifested in the water supply regardless of the lake's algal level.

B. <u>Consistency of Recent Proposal with Prior Colorado Nutrient Standard Setting</u>

As noted above, the Division is considering adoption of nutrient criteria for both TN and TP. The decision to regulate nitrogen is a major departure from prior regulatory actions that instead focused on phosphorus reduction as the means for controlling excessive plant growth. The Division's historical approach to phosphorus, not nitrogen regulation, was premised on the long established principle that phosphorus is generally considered the limiting nutrient in fresh waters that controls excessive plant growth. Regulating nitrogen may cause significant adverse impacts by promoting blue-green algal blooms that can produce toxins harmful to animal life. When nitrogen is limited in a freshwater system, these harmful algae can proliferate because they can acquire (fix) nitrogen from the atmosphere while other algal forms cannot. Various state decisions on the need for phosphorus, not nitrogen control, are discussed below. These earlier state decisions also underscore the need to connect nutrient reduction needs with controlling excessive plant growth. These prior decisions did not assert that nutrient reduction was appropriate or necessary absent some indicator of excessive plant growth that would be controlled by nutrient limitations.

Colorado adopted nutrient standards for Dillon Reservoir in 1984 and subsequently for Chatfield, Cherry Creek, and Bear Creek Reservoirs. Each has been subject to triennial review hearings and significant data collection and analysis over the years. Site-specific standard setting, along with Control Regulations to allocate wasteloads among point and nonpoint sources, is the tradition for Colorado. Chatfield and Cherry Creek Reservoirs have been heavily studied. Triennial review hearings in 2008 and 2009 provided insight on correlation, or lack of it, between phosphorus and chlorophyll 'a' concentrations in these waters. Appendix B provides a short description of the basis for nutrient regulatory activities for those waters. In no case was nitrogen reduction recommended to control plant growth. At this time there is no reason to believe TN reduction is needed to protect these important state waters.

In each of these cases nutrient regulation resulted from a conclusion that excessive plant growth needed to be controlled and that phosphorus, not nitrogen, was the nutrient that could best achieve this objective. This underscores two important principles that are not addressed in the Division's preliminary proposal:

(1) the need to tie nutrient regulation to a demonstration that excessive plant growth is occurring or expected to occur and,
(2) an analysis of which nutrient form should be regulated to achieve this objective.

C. General Concerns with Lakes and Reservoirs Proposal

The lakes and reservoirs proposals are based on data accumulated from Dillon Reservoir, Chatfield Reservoir, Cherry Creek Reservoir, Bear Creek Reservoir, Barr Lake and others over many years. These data were analyzed to predict a relationship between plant growth (measured as chlorophyll 'a') and nutrient concentration. While a correlation does exist between these parameters, the specific morphology and ecology of a lake dictates the degree to which plant growth will occur and the level of nutrient load that is necessary to protect uses. Shorter detention time ponds do not respond in the same manner as deeper lakes (*e.g.*, Dillon Reservoir). Therefore, the relationship developed for the deeper and larger lakes assessed by the Division does not provide a uniform basis for regulating all standing waters covered by the proposed criteria. Shallow lakes with considerable emergent plant growth also respond in a very different manner because nutrient cycling differs in that setting. Failure to account for these differences will result in mis-regulation of lake resources. Moreover, it is apparent that in lake systems control of both TN and TP is not required to control plant growth. Literature sources have long recognized that TN control, in particular, may produce adverse impacts in lake systems.

D. General Concerns with Streams and Rivers Proposal

Regarding the draft Streams and Rivers nutrient objectives, the first critical point to note is that these nutrient objectives are <u>not</u> related to excessive plant growth even though the basic purpose of nutrient regulation is to avoid excessive plant growth. Thus, even where a stream is not exhibiting signs of cultural eutrophication, stringent nutrient limits may nonetheless be imposed on contributing sources. These criteria were generated by using a macroinvertebrate (insect) population metric –MMI.[2] After selecting minimally human-impacted "healthy" streams as reference reaches, the Division measured multiple elements describing that reference site, such as the macroinvertebrate population, and contained those elements in the MMI data base. Among those elements is a water quality data base which includes the TP and TN concentrations in those waters. Consistent with Colorado practice to define an existing or ambient quality, the 85th percentile concentration of all of the reference sites was determined for TN and TP. The values were then adjusted slightly upwards to estimate a level of nutrient impairment that might be caused at higher nutrient concentrations.

The critical question is whether adjusting the 85th percentile ambient quality (adjusted or not) for non-impacted waters is truly a reflection of a likely impairment threshold where too much phosphorus or nitrogen will cause excessive plant growth and adverse impacts to the density and diversity of macroinvertebrates. The simple answer is NO, because the 85th percentile comes from reference streams selected as *not* being impaired. A condition of "non-impairment" does not provide a demonstration of where an impairment threshold

[2] In the long run, this MMI will be important not only for setting nutrient standards, but also used for identifying impaired waters for 303(d) listing. The MMI score is impacted by a host of factors such as metals, nutrients, temperature, sediment deposition, human caused rip-rap for flood control, etc See http://cfpub.epa.gov/caddis/index.cfm.

will occur. (*Leather Industries of America v. EPA,* 40 F. 3d 392 (D.C. Cir 1994). Moreover, as noted by the SAB, there is no direct mechanistic relationship between nutrient levels and invertebrate impairment. Only where excessive plant growth occurs would one anticipate nutrient-related invertebrate decreases. In many stream environments, increased nutrient loads do not cause excessive plant growth. This was precisely the issue addressed in the recent SAB review of these regression methods and was also raised by the State of Florida regarding EPA's proposed stream and canal nutrient objectives (See, Appendix C).

The supporting documents from the Division provide no examples of impairment where the MMI score is below these thresholds due solely to nutrients. Appendix D is a listing of Colorado streams to illustrate the relationship---or lack of it---between the MMI score and a grab sample based water quality concentration for TP and TN. A classic example is a type 1 site with an MMI score of 20 (below the impairment threshold of 36) and a TP concentration of 2.42 mg/l. A correlation appears to be made, but a site visit shows that the site is full of rip-rap from stormwater damage rehabilitation. The rip-rap alone, and not the nutrient load, creates the low MMI score. In reviewing the data, many sites can have similar TP concentrations and very dissimilar MMI scores. There is no correlation. Likewise, since TN is not expected to be a limiting nutrient in freshwater streams, there would be no expectation to find a correlation between this parameter and MMI score.[3]

E. Effect of Proposed Nutrient Objectives on Assimilative Capacity of State Waters

Under the CWA, a water body must have assimilative capacity to allow the discharge of a pollutant to occur, or meet the standard at the end of the pipe, if not be better than the standard to dilute the stream's excessively bad water quality. To understand how assimilative capacity is affected by the proposed criteria, a comparison to natural background levels is appropriate. The Division has identified the following nutrient concentrations as the 75th percentile nutrient concentrations found in undisturbed/minimally impacted waters.

Colorado's Reference Set Outlier Threshold

	TP (mg/l)	TN (mg/l)
Cold Water Biota	0.057	0.844
Warm Water Biota	0.146	1.098

These background levels are close to or exceed the recommended stream criteria for TP and TN, indicating little or no assimilative capacity will be available. Compare the TP warm water outlier threshold of 0.146 mg/l to the standard of 0.135 mg/l; TN warmwater

[3] In recently issued TMDLs for three watersheds in Pennsylvania, EPA acknowledged that TN levels were not causing any "stressor response" to invertebrate populations. Consequently, EPA recommended that TN controls not occur. (*e.g., "Nutrient Total Maximum Daily Load in Goose Creek Watershed, Pennsylvania"*, June 30, 2008)

outlier threshold of 1.098 mg/l to the standard of 1.316 mg/l; and TN cold outlier threshold of 0.844 mg/l to standard of 0.824 mg/l.

Furthermore, any available assimilative capacity is easily consumed by multiple or single sources to streams: the wastewater treatment plant's untreated TP effluent in the 4 to 7 mg/l range; agricultural pasture lands emissions in the Cherry Creek area are in the 0.25 mg/l range while hay field runoff elsewhere is in the 8.7 mg/l; range and limited agriculture and urban area emissions are in the 0.02 to 0.03 mg/l range (per Cherry Creek study). TN in wastewater discharges typically ranges from 20-40 mg/l. Stormwater often exceeds 3-5 mg/l and agricultural sources often range from 5-15 mg/l. Thus, the little assimilative capacity that exists has to be shared among many sources of TN and TP, including urban runoff, agricultural runoff, atmospheric deposition and municipal effluent dischargers.

This is the crux of the problem. The suggested standards are so low and the background so high, there is no assimilative capacity available for *any* sources. Consequently, all sources must dramatically reduce their loading in order for each one to continue to exist, much less grow. The question is: Are these nutrient criteria properly related to actual environmental impairments that need to be remedied, or are these based on presumptions that are not related to actual needs?

The 2010 Clean Water Act Section 305(b) biennial report on water quality was recently adopted by the Water Quality Control Commission. It describes numerous reservoirs as eutrophic, which could mean nutrient problems. (See Appendix A) These reservoirs are: Jackson, Prewitt, North Sterling, Henry, Meredith, Holbrook, Adobe Creek, Steamboat, and Williams Creek. Not all of these eutrophic water bodies are listed for Section 303(d) purposes. However, no streams and rivers are described as eutrophic in this report. This indicates that adoption of stream standards would radically alter impairment listing for these waters.

F. <u>Subsequent Regulatory Adoption Activities</u>

The above initial nutrient proposals will be further discussed in September, October, and November 2010, but meetings in June, July and August continue to lay foundations for these discussions. The Proposal for Rulemaking will be issued February 2011. Rulemaking to adopt the Proposal as Table Value Standards ("TVS") will be June 2011. Upon adoption, these TVS take on a presumption of propriety and will likely be recommended for all segments in each Basin Hearing, *i.e*., San Juan (2011), Arkansas (2013), Upper Colorado (2014), and South Platte (2015). At each Basin Hearing, evidence to counter the presumptive TVS can be presented to justify a more site-specific standard. This sequence of adopting a TVS and then subsequent Basin hearings is the normal process for Colorado. In light of EPA's objection to Florida's similar approach to develop site-specific standards, and EPA's proposing its own standards throughout Florida, it cannot be assumed that EPA will accept Colorado's more deliberative and time consuming approach. In any event, given the Division's limited consideration of actual uses/impairments, and the limited factors considered in setting the lake and stream standards, one may expect limited opportunities to establish more appropriate site-specific objectives on a watershed basis. Whether the TVS will be adopted to allow cost–effective, site-specific standard setting needs to be determined. EPA has not announced any objection to following the usual approach and the long-term schedule contained on the Commission website. However, the EPA justification for its proposal to adopt statewide standards for Florida was that their proposed site-specific approach would be too time consuming and delay protection of the uses.

Colorado's water quality regulations also allow granting a Temporary Modification upon demonstrating that the TVS, or other standard, is without sufficient scientific support and that the necessary standard to protect the use is scientifically uncertain. With a Temporary Modification, a plan to resolve the uncertainty can result in a permit based compliance schedule to march forward to obtain the scientific data necessary to determine the standard necessary to protect the use.

After the final standard is adopted, a Total Maximum Daily Load ("TMDL") process may be used to allocate the reductions in current loadings from point and nonpoint sources to attain the new standard. Once a water quality-based effluent limit or TMDL allocation is issued in the permit, then a schedule is imposed to achieve compliance as soon as possible unless a variance is granted to give further time to determine how to get into compliance. Such a variance, known as a Discharger Specific Variance, may be authorized in the Basic Standard hearing in June 2010. The current segment-wide Temporary Modification, for determination of the feasibility of treatment technology, may be phased out and replaced by the Discharger Specific Variance.

III. EVALUATION OF SCIENTIFIC APPROACH

A. <u>SAB Review of Similar Approaches</u>

Since early 2008, EPA has presented state agencies and Regional Technical Advisory Groups with information indicating that simplified approaches may be used to develop stream nutrient standards. The Division's proposal appears to embrace that advice from EPA Headquarters. In September 2009, EPA published a draft guidance document entitled "*Empirical Approaches for Nutrient Criteria Derivation"* and submitted the document to the Science Advisory Board Ecological Processes and Effects Committee for review. The SAB review was requested by a group of municipalities that had been adversely impacted by application of these methods to derive nutrient objectives in several Pennsylvania watersheds. That SAB Committee roundly criticized the simplified regression methods as not demonstrating "cause and effect" and likely to result in misplaced regulatory determinations. Key findings of the SAB relevant to this rulemaking activity include the following:

(1) Cause and Effect Demonstration Necessary

> *[T]he final document should clearly state that statistical associations may not be biologically relevant and do not prove cause and effect. (at 2, italicized text in*

last paragraph) Without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels will lead to the desired outcome. (at 6, first paragraph); The Guidance needs to clearly indicate that the empirical stressor-response approach does not result in cause-effect relationships; it only indicates correlations that need to be explored further. (at 41, bullet #1)

(2) Biological Significance/Use Impairment Threshold Relationship

The Committee emphasizes the importance of choosing the biological endpoints (i.e., response variables) that respond specifically to nutrients. We note that responses of benthic indices can be related to many types of stress. We question why periphyton would not be a better receptor to measure. (at 16, second bullet from bottom)

(3) Consideration of Factors Influencing Nutrient Dynamics/Impairment Metric

The examples provided in the Guidance generally do not demonstrate a strong nutrient stressor linkage to beneficial use impairment. The stream examples show very weak correlations that have high levels of uncertainty, and the examples lump data from distinctly different ecosystems where multiple factors in addition to nutrients will contribute to biotic responses. (at 16, fourth bullet)

In order to be scientifically defensible, empirical methods must take into consideration the influence of other variables. (at 24, 2nd bullet from bottom)…The statistical methods in the Guidance require careful consideration of confounding variables before being used as predictive tools. … Without such information, nutrient criteria developed using bivariate methods may be highly inaccurate. (at 24, first complete bullet)

For criteria that meet EPA's stated goal of "protecting against environmental degradation by nutrients," the underlying causal models must be correct. Habitat condition is a crucial consideration in this regard (e.g., light [for example, canopy cover], hydrology, grazer abundance, velocity, sediment type) that is not adequately addressed in the Guidance. Thus, a major uncertainty inherent in the Guidance is accounting for factors that influence biological responses to nutrient inputs. Addressing this uncertainty requires adequately accounting for these factors in different types of water bodies. (at 38, first bullet). Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection. (at 38, third bullet)

(4) Stream Considerations

Single variable stressor-response relationships (e.g., those derived using the simple linear regression approach discussed in the Guidance) that explain a substantial amount of variation are likely to be uncommon for most aquatic ecosystems (in particular, streams). (at 12, second bullet); As previously discussed, relationships for streams may be more complex than for lakes and must account for multiple stressors/conditions and/or stream 'types' or conditions, and then be applied appropriately. (at 25, first bullet)

(5) Loading versus Concentration Approach

A basic conceptual problem concerning selection of nutrient concentrations as stressor variables (as illustrated in the Guidance) is that nutrient concentrations directly control only point-in-time, point-in-space kinetics, not peak or standing stock plant biomass. Plant biomass is driven by nutrient supply rates (i.e., nutrient mass loads). Ambient nutrient concentrations are not necessarily good surrogates for nutrient mass loads. Relationships between nutrient mass loads and ambient nutrient concentrations are highly system-specific and depend on many factors including inflows, hydrology, bathymetry, sediment-water exchanges and chemical-biological processes. Consequently, there may be many systems for which nutrient concentrations will not be appropriate stressor variables. For such systems it may be more appropriate, and scientifically defensible, to use site-specific mechanistic models incorporating loading to determine the nutrient controls required to attain designated uses. (at 13, first bullet)

EPA has also provided additional background documentation regarding what should constitute an acceptable "weight of evidence" approach used in criteria development. ("*Using Field Data and Weight of Evidence to Develop Water Quality Criteria," Cormier et al, 2008 SETAC*). That document, prepared by EPA's Office of Research and Development, specifies the following with respect to criteria derivation:

> *Development of numeric WQC is based on 3 basic assumptions: First, causal relationships exist between agents and environmental effects. Second, these causal relationships can be quantitatively modeled. Finally, if exposures to the causal agent remain within a range predicted by the quantitative model, unacceptable affects will not occur and designated uses will be safeguarded. Therefore, for criteria to be valid there must be evidence that the criteria are based on reasonably consistent and scientifically defensible causal relationships*.

The methods employed by the Division for generating the preliminary stream nutrient standards were based on the same type of statistical methods critiqued by the SAB. Consequently, the predicted "relationships" suffer from the same uncertainties. In particular, it has been long understood that nutrients do not directly impact invertebrate populations. (See, *Nutrient Criteria Technical Guidance Manual: Rivers and Streams*, EPA-822-B-00-002 (July 2000), at 85.) Nonetheless, nutrient values were derived based on an assumed relationship with the MMI score (an invertebrate metric). That regression analysis is merely a correlation and does not, in any way, demonstrate that changing nutrient levels actually caused the change in MMI score. Actually, the opposite is true. There is extensive data showing that changes in stream MMI are primarily tied to changing habitat, not nutrient concentration. For lakes, a relationship with excessive plant growth does often exist; however, it tends to be more a function of nutrient loading and not the concentration, which is subject to several confounding conditions, as the SAB report noted.

The SAB report strongly concluded that the simplified statistical methods not be used as the primary basis for criteria derivation, since the methods may lead to erroneous regulatory determinations that waste resources and fail to protect the environment. Based on these concerns, a more careful assessment of the underlying science and certainty of the relationships predicted by the Division would seem prudent. The need to establish a clear "cause and effect" relationship prior to adopting stringent nutrient criteria, especially for nitrogen, is discussed further below.

B. Major Technical Concerns

There are several significant technical and socioeconomic concerns with the Division's current nutrient criteria proposal. These concerns may lead to broad misallocation of municipal, agricultural and commercial resources regulating nutrients where problems do not exist, and inadequately regulating such pollutants where problems persist. These concerns, also raised by EPA's SAB, result from several critical omissions in the underlying scientific assessment:

(1) Regulating Non-Limiting Nutrients (TN Control)

Perhaps the single greatest concern with the proposed criteria is the recommendation that both TN and TP be regulated in all waters. This proposal is made even though there is no information or analyses presented showing that TN control will provide any additional benefits beyond phosphorus control. It is widely recognized in the literature that lowering nitrogen levels, particularly in lakes, may promote harmful algal blooms and cause major adverse ecological impacts. Nitrogen removal may also be an energy intensive process and is very difficult to implement from a stormwater perspective. Dissolved forms of nitrogen must be converted into plant biomass or denitrified to be removed from the environment. BMPs are generally not capable of achieving significant TN reduction beyond that achieved by removing the nitrogen associated with particulate matter. The suggested TN criteria, approximately 1 mg/l, cannot be achieved in practically any water that receives a municipal or agricultural loading. Consequently, virtually all point sources would need to be eliminated and the associated water would not be available for downstream users, even though there is no objective ecological basis to justify such stringent controls.

(2) Presumed Impairments Rather Than Confirmed Impairments

The Division's proposal is based on a key, unsupported assumption – invertebrate reductions are due to nutrient concentrations. As noted by the SAB (and EPA's own guidance), there is no direct mechanistic relationship between nutrient impairment and invertebrate levels. For nutrients to cause invertebrate impairment they must cause excessive plant growth and such plant growth must cause a change in habitat or water quality that will impair invertebrate populations (*e.g.*, low DO). This proposal, as with EPA's discredited guidance, will regulate nutrients even where low plant growth and no low DO is occurring due to physical factors. In such circumstances, nutrient regulation is simply unnecessary. The SAB recognized that multiple stressors influence metrics such as MMI. Failing to account for those factors will, in many situations, lead to mis-regulation and to continued environmental impairment, as the wrong parameter was regulated. This occurred in a series of Pennsylvania TMDLs where EPA's streamlined methods were applied. ("*Critical Evaluation of EPA Stream Nutrient Standard Initiative*", W. Hall et al., BNA Environment Reporter, July 3, 2009). In those situations, both unimpaired waters and impaired waters received stringent nutrient limits. However, in none of the cases were nutrients actually the cause of the invertebrate impairments. The only reasonable way to avoid this situation is to require confirmation that nutrients are actually the cause of an alleged impairment.

(3) Failure to Account for Confounding Factors/Habitat Influences

Stream environments are highly variable, subject to numerous stressors and a great range of aquatic life due to habitat influences. Some of this is natural, but some is man-induced. Unless the confounding factors are assessed, mis-regulation will occur. For example, invertebrate levels are low in several areas of the Platte River, where only sandy substrate exists. These same conditions do not favor plant growth. However, since the MMI approach does not inquire as to the cause of reduced invertebrate populations, these sites are improperly regulated as nutrient impaired. Likewise, merely plotting plant growth versus TN or TP concentration for a lake does not provide the necessary information for establishing a nutrient reduction program. It is well recognized that the standing crop of algae is a function of loading and nutrient availability. Depending upon physical and biological factors, the conditions that lead to an unacceptable algal condition could be transient and not related to the current water column concentration. That is why most algal/nutrient relationships for lakes vary by at least a factor of four or greater. This was clearly documented before the SAB and in EPA's recent nutrient criteria proposal for the State of Florida. Understanding why the plant growth varied to this degree requires more careful consideration of lake morphology and biology.

(4) Failure to Assess the Likelihood of Use Restoration

A key factor addressed by the SAB was the need to assess uncertainties associated with generating nutrient standards based on simplified regression analyses. Such uncertainties are considerably greater for variable stream environments where the nutrient plant response is governed by a host of physical factors. By establishing a procedure to assess actual impairment causes, more appropriate application nutrient objectives is ensured. This procedure is particularly important where man-made waters are at issue. In those cases, there is no preconceived notion of the degree of water quality that could or should be attained. Where large reservoirs are established with a major contributing watershed, higher algal growth would "naturally" be expected because one has turned a stream/river environment to a lake environment. In these cases, the desired uses should control decision-making. In Minnesota's recent lake criteria adoption, application of lake standards to reservoirs was excluded because there was no direct way to establish the water quality that would be expected to exist in such waters absent significant human influences. All such waters are addressed on a case-by-case basis considering watershed and use factors.

IV. IMPACT OF PROPOSED CRITERIA ON REGULATED COMMUNITY

A. Scope of Impairment Designations

There are numerous locations throughout the state where, based only upon grab samples, TP and/or TN exceed the suggested stream standard. As a generalization, where the phosphorus sample exceeds the standard, so, too, does the nitrogen sample. Listing per 303(d) for violation of the standards is potentially to occur at such significant locations as:

Locations with phosphorus greater than 1.0 mg/l

South Platte River downstream of Evans
South Platte River upstream of Cherry Creek
South Platte River near Thornton
South Platte River below Clear Creek confluence.
South Platte at Fort Lupton
South Platte near Kersey
Big Dry Creek downstream of Westminster
Boulder Creek Oxbow from Town of LaFayette
Cache La Poudre below Mishawaka
Clear Creek at Tennyson
Monument Creek at Northgate
Fountain Creek at Pinon
Sand Creek at Academy
Cucharas River at Highway 10
North Fork Gunnison below Paonia
Colorado River

Locations with phosphorus greater than 0.2 mg/l

Cache La Poudre near Greeley
St Vrain Creek below St Vrain Valley WWTP
St Vrain Creek below Longmont WWTP

Cripple Creek above Fourmile Creek
Fountain Creek at Pueblo
Cucharas River below Walsenburg
Roaring Fork above Aspen
Brush Creek at mouth near Snowmass
Colorado River near Cameo
Animas
Naturita Creek at Naturita
South Platte River at multiple locations
Cherry Creek at multiple locations

<u>Locations with phosphorus greater than 0.1 mg/l</u>
Arkansas River near Lamar
Dolores River near Gateway
Sand Creek below Aurora WWTP
Boulder Creek near mouth
Cochetopa Creek near mouth
Frazer River below Robbers C.G.
Gore Creek at mouth
Saguache Creek near Saguache
Navajo River above Chromo
Eagle River above Gore Creek
Eagle River at Avon
Big Thompson below Estes Park
Cimmarron River below Squaw Creek
Piceance Creek above confluence with Bear Gulch
Purgatoire River above confluence with Salt Arroyo

This is not a complete list. It is reasonable to expect that it will greatly expand if the proposed criteria are adopted. In particular, TN objectives are expected to be exceeded in all waters with municipal or agricultural input. This includes waters on the western slope as well as those east of the front range. If the nutrient standards are solely numeric and not tied to documenting adverse plant growth levels, then it is expected that the proposed standards will be exceeded in virtually all waters influenced by human development.

On the other hand, if the adopted nutrient standards are a narrative/numeric hybrid that also requires a demonstration that nutrient-caused use impairment thresholds are exceeded, the extent of waters identified as nutrient impaired will likely be far less. Such use impairment thresholds could include evidence on the presence of algae sufficient in quantity to cause dissolved oxygen deficits that are likely to impair the aquatic life use. Where drinking water uses are paramount, evidence of nutrient induced taste and odor problems that are not currently remedied through applicable treatment technologies could be required. In any event, simply declaring any water with elevated nutrient levels to be nutrient impaired should not occur, as it is expected to result in statewide misallocation of resources. The State of Florida raised this same concern regarding EPA's proposed nutrient criteria.

B. <u>Regulatory Implications of Broadly Classifying State Waters as Nutrient Impaired</u>

As proposed, the Division's draft numeric nutrient standards will result in virtually all of Colorado's lakes, rivers, and streams downstream of urban and agricultural areas being designated as CWA § 303(d) impaired waters. With this impaired designation, federal rules impact state permitting and growth in these watersheds. Putting aside the scientific and technical appropriateness of these designations, the state and Region VIII would suddenly be responsible for preparing TMDLs for all of these newly impaired waters. Properly promulgating TMDLs for hundreds of waters would be an extremely formidable task and, realistically, would take more than a decade to complete. Because TMDLs will not be available to guide permit decisions for an extended period, pre-TMDL permitting of new and existing discharges will become a very important issue. There are several federal rules applicable to this issue – 40 CFR 122.4(i) and 122.44(d). Based on these rules, permitting agencies have been forced to take various case-by-case interim approaches *(e.g.*, maintain status quo until TMDL is released, institute preliminary load reduction measures). EPA, however, has been pushing for a more restrictive position on pre-TMDL permitting – permittees should meet water quality standards as "end of pipe" limits pending TMDL development. It would be physically impossible for stormwater, agricultural or municipal sources to meet this objective. Given the vast number of waterbodies which will become impaired as a result of the Division's proposal, adopting EPA's more stringent approach to pre-TMDL permitting will have severe economic and social ramifications on municipal and commercial operations across the state. The following is a summary of the applicable regulations and the approaches various agencies have taken in interpreting these regulations.

(l) <u>New or Expanding Sources</u>

For new and expanding dischargers to impaired waters, the federal rules are fairly definitive on allowable pre-TMDL activities. Simply put, more often than not, new discharges cannot occur. As set forth in 40 C.F.R. Sec. 122.4(i):

> "No permit may be issued: … (i) To a new source or a new discharger, if the discharge from its construction or operation will cause or contribute to the violation of water quality standards... of this chapter.

Although the regulation specifically sets forth an exception in situations where a TMDL has already been issued, it contains no similar exceptions for new dischargers to an impaired water without a TMDL in place. However, some permitting agencies (and reviewing courts) have interpreted the "cause or contribute" requirement of the regulation to allow new dischargers to impaired water bodies without TMDLs, if those dischargers obtain enough offsets such that there is no net increase in existing loadings. *E.g., Arkansas v. Oklahoma*, 503 U.S. 91 (1992) (Holding that agency could not categorically ban new discharges to impaired waters); *Annandale/Maple Lake*, 731 N.W.2d 502 (Minn. 2007) (Holding that agency could reasonably interpret 122.4(i) to allow a new discharge if sufficient offsets were instituted); but see, *Friends of the Wild Swan v. United States*

EPA, 74 Fed. Appx. 718 (9th Cir. 2003) (Holding that district court could properly enjoin state from issuing permits to any new or expanding dischargers under 122.4(i)). The problem in this instance is that it is apparent that elimination of virtually all point source contributions will be needed because the technology does not exist to treat TN down to 1.0 mg/l. For this reason, there will be no "offset" available to accommodate new growth. Given the suggested nutrient criteria for TN in particular, these criteria essentially dictate that the state impose a moratorium on growth.

Once the TMDL is completed, 122.4(i) allows a new source of pollutants to be permitted *if* it is clear that other sources will be sufficiently reduced and provide capacity for the new source loading. The 9th Circuit has indicated proof of assimilative capacity must be demonstrated, not presumed, to exist. *Friends of Pinto Creek v. US EPA*, 504 F.3d 1007 (9th Cir, 2007) (Holding that a new source to an impaired water with a TMDL could not be permitted because the exceptions to 122.4(i) were not met). The court disapproved of the permit at issue because there was no guarantee that the offsets would be implemented to create sufficient load allocations.[4] Again, as the nutrient targets will be exceeded even by background concentrations in many settings, there is no available assimilative capacity and no new discharge could be added to these waters.

(2) <u>Existing Sources</u>

Another regulation which is used to establish pre-TMDL permitting requirements is 40 C.F.R. § 122.44(d). This regulation sets forth a mechanistic step-wise framework for setting water quality-based effluent limitations ("WQBEL"), whether or not a TMDL has been adopted. WQBELs are established as "necessary to [a]chieve water quality standards established under Section 303 of the CWA." 40 C.F.R. § 122.44(d)(1).

The trigger for initiating a WQBEL analysis is when a permitting authority determines that pollutants "are or may be discharged at a level which will cause, or have the reasonable potential to cause, or contribute to an excursion above any state water quality standard." 40 C.F.R. § 122.44(d)(1)(i). Although the regulations clearly require that an effluent limit must be assigned to dischargers that are deemed to cause or contribute to an exceedance of a state water quality standard, 122.44(d) is silent on what a permitting agency must do in situations where a TMDL is pending.[5]

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[4] Environmental groups in Colorado are now citing the *Friends of Pinto Creek* decision for the position that new or expanding sources are categorically prohibited from discharging to impaired waters, with or without a TMDL. As proposed, Colorado's Trading Policy would allow for "offsets" where an existing point or nonpoint source's loading is reduced in order to expand a current or new source pending development of a TMDL. But it should be noted that if the environmental groups are successful and "offsets" are not allowed under 40 CFR 122.4(i) (either before or after TMDL development), the possibility of a new or expanding source is, for all practical purposes, eliminated until full standards compliance is achieved by other existing sources.

[5] Specifically, there is no discussion on (1) the timing of developing such WQBELs; (2) whether the 303(d) process may be employed for the development of final WQBELs; (3) the ability of the state to set interim limitations; or (4) the state's ability to impose a permit prohibition absent the availability of the final WQBEL. EPA was also quite clear that 40 C.F.R. § 122.44(d) did not mandate a particular approach for

Recognizing (1) the number of existing dischargers to impaired waters across the country, (2) the practical impact of prohibiting these dischargers, and (3) the potential for subsequently promulgated TMDLs to further modify interim limitations, state permitting agencies have generally interpreted 122.44(d) to allow an existing discharger to maintain its load contribution until a TMDL is created. See also, *In the Matter of the Alexandria Lake Area Sanitary District*, 763 N.W.2d 303 (Minn. 2009); *Comm. for a Better Env't v. State Water Resources Control Board*, 109 Cal. App. 4th 1089 (Cal. Ct. App. 2003).

Despite current state agency practice and the uncertain language of the controlling regulations, EPA has recommended a more restrictive approach to pre-TMDL permitting. When asked whether 122.44(d) required that a state impose end-of-pipe limits on all existing dischargers to impaired streams, EPA's then-Assistant Administrator stated that "there are a number of ways to issue permits for discharges to impaired waters." Letter from Benjamin Grumbles, EPA Headquarters, to Hon. Norm Coleman, U.S. Senate (August 29, 2005). Although this initial response appears to endorse the flexibility used by many of the state and regional permitting agencies, he then elaborated on his statement and listed the following three permitting options: (1) "permits may be issued… for discharges that do not contain the pollutant causing the impairment," (2) "permits may be issued with…end-of-pipe limits," and (3) permits may be issued "where it is demonstrated that other pollutant source reductions will offset the discharge." The letter then concluded by saying that "irrespective of the attainment status of the receiving water body… the State must establish effluent limitations or other permit controls as stringent as necessary to meet the applicable water quality standards."

These EPA statements deviate substantially from the "status quo" interpretation being used by permitting agencies across the country.[6] However, if the Division's proposal for numeric standards is approved as is, under EPA's recommended approach, existing discharges must meet the numeric criteria as an "end of pipe" limit pending TMDL development. If Colorado were to employ a similar strategy, the renewed permits to existing wastewater facilities would violate these new standards. At the same hearings

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WQBEL development and states may adopt appropriate procedures themselves. 54 Fed. Reg. at 23879 ("Subparagraph (vii) does not prescribe detailed procedures for developing water quality-based effluent limits. Rather, the regulation prescribes minimum requirements for developing water quality-based effluent limits, and at the same time, gives the permitting authority the flexibility to determine the appropriate procedures for developing water quality-based effluent limits.") (emphasis supplied).

[6] EPA's recent statements also stand in contrast to past statements made by the Agency. Specifically, EPA sought to adopt interim permitting requirements pending TMDL/WQBEL completion for a subcategory of existing sources – "large new and significantly expanding discharges." (64 Fed. Reg. at 46068) In this proposal, EPA noted that "it might be very disruptive to existing dischargers if they were required to offset their discharge before a TMDL is established only to possibly receive different permit limits and conditions once wasteload allocations and a margin of safety are established in a TMDL. EPA seeks to avoid these disruptions if possible." In 2000, EPA withdrew that proposal, finding it to be "simply unworkable." (65 Fed. Reg. at 43640). If EPA had intended for the original regulation to mandate stringent pre-TMDL permitting limits to existing dischargers causing or contributing to an existing impairment, it certainly wouldn't have proposed to adopt interim permitting requirements to a subcategory of these existing sources.

adopting the standards, the individual dischargers would have to present their cases for Discharger Specific Variances ("DSV"), assuming this variance process is approved by the Commission on June 8, 2010. That DSV application includes an alternatives analysis of all means to be in compliance, including termination of the discharge. The application includes selection of the highest degree of protection of the use as interim technology measures, if full attainment is not feasible. It is possible that these interim protection measures include nonpoint source offsets by point sources.

As this review demonstrates, pre-TMDL permitting is clearly an unresolved area of the NPDES program. Regional and state permitting approaches are varied and differ dramatically with suggested language from EPA Headquarters. Aside from the standards themselves, the pertinent legal decisions have reached the same general conclusions, though they, too, contain substantial deviations. For instance, most courts seem to think that 122.4(i) is clear and, thus, prohibit new dischargers to impaired waters unless there is a TMDL. However, the *Annandale* case found the regulation to be ambiguous and allowed the new discharge if an offset was provided. Similarly, most courts seem to agree that 122.44(d) is ambiguous and, at a minimum, existing dischargers should be allowed to maintain performance in pre-TMDL situations. However, the EPA Headquarters has decided that permits should not be renewed unless substantially more restrictive limitations are applied. How the Division intends on addressing these various circumstances has yet to be determined.

(3) <u>Federal Initiatives Regarding NPS Control</u>

Although the proposed standards will have an immediate and direct impact on Colorado's point source dischargers, it is clear that that nonpoint sources ("NPS"), historically not subject to regulation, will also be subjected to major restrictions. In the case of Colorado, it will be impossible for point source regulation alone to achieve the extremely restrictive proposed standards. In these situations, EPA has orchestrated NPS control programs and best management practices ("BMP") for impaired watersheds across the country (see below). As such, these proposed standards are also expected to have major implications on all unpermitted contributors of nutrients including, but not limited to, the agricultural, ranching, water transfers and mining interests. The following is a brief description of these NPS programs and a discussion their impacts have to the NPS community.

Charles River

In an effort to improve the Charles River's longstanding problems with nutrients, EPA recently proposed a stormwater program for large industrial, commercial, and residential facilities in the River's upper reaches. This effort, designed to shift some of the stormwater burden from municipalities to private properties, forces larger privately-owned stormwater sources to choose between meeting their own specific standards and working with the local government on a community-wide approach. Through a wide array of stormwater controls and management practices, facilities will be responsible for reducing their phosphorus discharges to the municipality by 65 percent. The estimated program cost is over one *billion* dollars.

Delaware Inland Bays

Due to urbanization, agricultural activities, and low flushing rates, the Delaware Inland Bays were becoming heavily enriched with nitrogen and phosphorus. To correct the problem, a TMDL was prepared for the region for both nitrogen and phosphorus. All point sources were given a zero discharge requirement. The TMDLs called for a 40% reduction in nonpoint phosphorus and anywhere from 40% to 85% reductions in nonpoint nitrogen. The state is presently regulating individual septic systems as ground water load contributors. Agricultural stakeholders potentially impacted by these required reductions met to discuss the most cost-effective and results-driven techniques to meet the limits. The nonpoint source controls utilized included, but were not limited to, liquid waste management, animal waste storage, manure relocation, buffers, grass filter strips, cover crops, and water control structures.

Chesapeake Bay

As a means to substantially reduce nutrient loadings to the Chesapeake Bay, EPA is set to release a final TMDL in 2010. In conjunction with this TMDL, the affected states and the District of Columbia are to provide EPA with “reasonable assurance” that NPS loading reductions will be achieved. In addition to this, each state and the District of Columbia has created Clean Water Accountability programs which set forth how to achieve nutrient reductions from all sources including nonpoint sources. Although the techniques used to control nonpoint source pollution vary throughout the large watershed, they focus heavily on agricultural practices and stormwater run-off. Specific programs include: cover cropping in the winter, regulated application of manure, animal waste storage systems, livestock restrictions in streams, re-grassing and foresting areas, creation of riparian zone buffers, and low-impact eco-friendly development and design.

Klamath River

Spurred by a fishkill of over 33,000 salmon, EPA has been working with Oregon and California on measures to enhance the survival of threatened and endangered fish in the Klamath River watershed. Included in these measures were several nutrient TMDLs and a memorandum of agreement between all agencies that they would implement and enforce the NPS programs necessary to achieve the standards. Most of these BMPs and NPS programs were applicable to agricultural development, forestry programs, and the timber industry. Additionally, a lot of attention was paid to the dams and hydroelectric power sources found along the river. The Klamath River controls were driven mainly by the presence of threatened and endangered species in the river, whereby the agency is to presume that the river is impaired. For the Colorado lakes and rivers which are home to endangered species, this becomes a very important fact to consider.

(4) Likely Impacts on Regulated Community

Based on the expected condition that (1) virtually all streams in agricultural and urban areas will be identified as nutrient impaired, (2) all major reservoirs in eastern Colorado will be identified as nutrient impaired, and (3) some water transfers will be delivering water that has pollutant levels impacted by agricultural and urban sources (at concentrations above the applicable criteria), the following impacts on the regulatory community are likely to occur with adoption of the proposed objectives.

Municipal Wastewater: The impacts on municipal entities (and other industrial NPDES permittees) are the most straightforward. At permit reissuance, nutrient loadings will be, at a minimum, frozen to existing performance. This will force communities to construct both nitrogen and phosphorus reduction facilities to allow the growth currently authorized by the permit. Since compliance with applicable WQS will likely be impossible (barring the use of alternatives such as reverse osmosis), discharge of wastewater will ultimately be prohibited. If reverse osmosis is utilized, approximately 25% reject water (very high TDS) will occur, thereby reducing water for downstream users. If land application is not possible, plant expansion and future growth will be proscribed or some type of permanent WQS waiver will need to be granted.

Municipal Stormwater: Storm water discharges are all subject to NPDES compliance requirements, as are continuous dischargers. The stormwater BMPs will need to be configured to produce both nitrogen and phosphorus reductions likely in the 40-80% range (this was the range of reduction mandated by EPA nutrient TMDLs in Pennsylvania). The precedents of Chatfield and Cherry Creek are the strongest examples of nutrients standards necessitating Control Regulations that define the loading limits to the water body and then allocate that loading among background, point and nonpoint sources, atmospheric deposition, etc. The allocation then necessitates measures to reduce point and nonpoint sources to achieve reduced loading or limit new loading within defined pounds per day or per year limits. Non-numeric limitations on stormwater sources are already a reality. See http://www.cherrycreekbasin.org/cc_projects.asp for a listing of projects developed to reduce phosphorus to the Cherry Creek Reservoir.

Stormwater control through BMPs is the current regulatory framework. See www.bmpdatabase.org for information from a variety of sources on performance of various BMPS. Achieving anticipated TMDL reduction requirements will likely be impossible. Large detention basins that promote denitrification may be a possibility, assuming sufficient land is available. Such alternatives will significantly limit the amount of runoff available for downstream water withdrawals. If TN reduction is not possible, growth moratoriums may be imposed to ensure stormwater sources do not increase.

Agriculture: Agricultural impacts will be quite diverse and depend upon the type of operations occurring. Irrigation return flows with elevated nutrient levels will likely be subject to BMP requirements (setbacks, buffers, reduced fertilizer application) to reduce nutrient levels. This sequence of events is already playing out in the Chesapeake and Rehoboth Bay watersheds. Presently, there are limited regulatory vehicles to control agricultural runoff. It is expected that federal subsidies for crops will be tied to implementation of such activities. Colorado's Approach to Nonpoint Source Management (CDPHE, 2000) at Chapter 2 addressed agricultural nonpoint sources. Where a TMDL is to be implemented, then various tools may be used: Section 319 grants for Unified Watershed Restoration, EQIP financial assistance funds, Conservation Reserve Program based riparian buffer zones, and voluntary implementation of BMPs. Commission promulgated Control Regulations may impose mandatory requirements, within the limitations of the Colorado Water Quality Control Act. If an endangered species habitat is impacted by excess nutrient levels, federal water rights and federal crop subsidies may be greatly impacted, as occurred on the Klamath River in California.

Ranching: Various interest groups have been attempting for years to limit leasing federal lands for cattle operations. Where cattle operations contribute loadings to surface waters, granting such leases may be limited or proscribed. Cattle watering in streams will be prohibited and fencing of waterways is likely to be mandated as a BMP. For concentrated animal feeding areas ("CAFOs"), disposal of manure will be highly regulated and may require transport of manure to other watersheds where runoff and groundwater influences are decreased. If endangered species habitat is adversely impacted due to the nutrient contributions from cattle operations, federal subsidies and land leases may be proscribed.

Mining: Phosphorus is a naturally occurring element in the crust of the earth. Primarily, mining operations will be impacted to the degree such operations result in increased phosphorus contributions to surface waters due to leaching or sediment runoff. This may require extreme controls to prevent particulates from entering state waters and possibly additional pH controls to limit phosphorus mobilization from sediments. New mining operations to impaired watersheds will be prohibited unless a zero discharge is possible (see, *Pinto Creek* decision).

Water Transfers: Water transfers containing nutrients in the exercise of water rights may be subject to permits to limit nutrients. EPA promulgated its "Water Transfer Rule" in 2008 and by 2009, the Eleventh Circuit upheld it, but the Obama Administration, as of October 2009, is reconsidering the rule.[7] That rule shields some, but not all, water transfers from having NPDES discharge permits. Only water moving from one watershed to another watershed without putting the

[7] Friends of the Everglades v South Florida Water Management, No. 07-13829 (11th Cir. 2009) upheld EPA's Transfer Rule as "a reasonable, and therefore permissible, construction" of the Clean Water Act. The reasoning behind the Rule is that the pollutants are subsumed in unitary "waters of the United States" before the transfer and do not "add" pollutants to the "waters of the United States." This concept is referred to as the unitary waters theory.

water through an intervening domestic, commercial, or industrial use (*e.g.*, irrigation) does not require a permit. This would mean, generally, that only the initial transfer of water from a natural source would not be regulated. Downstream use of municipal effluent or water transfers following agricultural return flows may be proscribed under this provision.

State law may also be used to limit water transfers if adverse impacts are caused by the transfer. For example, if a downstream reservoir is hypereutrophic, is listed on 303(d) for nutrients caused impairment, and a TMDL results in allocations of reductions to multiple sources of loadings, this could mean that the transbasin diversion that discharges water with some nutrients will need to address how to reduce the loading. The issue may be a Water Quality Control Commission decision in a Control Regulation per CRS 25-8-205.
Arguably, nothing in our state law prevents necessary limits on any source subject to a TMDL to implement wasteload allocations, per 205(5) at the last sentence that:

This subsection (5) does not allocate wasteloads or relieve any source from participation in wasteload allocations determined necessary under any duly promulgated regulations established by the water quality control commission under this section.[8]

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[8] On the other hand, there are limits on what the Commission can do in the nature of a Control Regulation that impacts water transfers. By CRS 25-8-205(5), the Commission cannot adopt Control Regulations that require agricultural nonpoint source dischargers to utilize treatment techniques which required additional consumptive or evaporative use which would cause material injury to water rights. However, where incentives, grants, and cooperative programs are determined by the Commission to be inadequate and regulations are necessary to meet state law or federal act, then Control Regulations applicable to agriculture shall apply. The Colorado Water Quality Control Act at CRS 25-8-101 at 104 provides that water quality considerations are not to interfere with the exercise of water rights <u>unless a permit is necessary to protect the public health</u>.

> "No provision of this article shall be interpreted so as to supersede, abrogate, or impair rights to divert water and apply water to beneficial uses in accordance with the provisions of sections 5 and 6 of article XVI of the constitution of the state of Colorado….This section shall not be interpreted so as to prevent the issuance of a permit pursuant to sections 25-8-501 to 25-8-503 which is necessary to protect public health.

Consistently, the NPDES permitting regulations for the State of Colorado provide at 5CCR 1002-61:

> No person shall discharge any pollutant into any state water from a point source without first having obtained a permit from the Division for such discharge except that activities such as diversion, carriage, and exchange of water from or into streams, lakes, reservoirs, or conveyances structures, or storage of water in or release of water from lakes, reservoirs, or conveyance structures, in the exercise of water rights shall not be considered to be point source discharges of pollution under this article.

The important caveat to the statute and the regulation is the last sentence of the statute quoted above that where protection of public health requires, the prohibition on permitting water transfer does not apply. So where drinking water supply reservoirs are impacted by water transfers, permits can be required.

Given the applicable rules, certain water transfers containing nutrients are not likely exempt from permit limits. In particular, if downstream drinking water use reservoirs are impaired by nutrients and have TMDLs that require reductions to upstream sources, regulation of the water transfer activities could occur. New water transfers containing elevated nutrient levels could be proscribed by 40 CFR 122.4(i).

Water supply: Existing and future supplies may be restricted to the degree the source is a municipal effluent or a transfer that occurs after municipal or agricultural uses have occurred, as discussed above. In addition, if corrosion control uses phosphorus based compounds, water supplies may be required to alter corrosion control practices.

V. CONCLUSIONS AND RECOMMENDATIONS

The adoption of the proposed nutrient standards for Colorado waters is most likely going to occur in 2011. The Division is proposing to adopt uniform requirements applicable to general lakes and streams classifications regardless of setting, actual usage or whether nutrients are actually causing use impairments in these waters. At a minimum, phosphorus/chlorophyll 'a' objectives may be adopted for all of the major reservoirs in the state. As a result of this action, it is expected that nearly all major warm water reservoirs in the state will receive a "nutrient impaired" designation. Since these areas receive flows from upstream urban and agricultural areas, the regulatory impact of these designations will be far reaching. Should the Division adopt the proposed stream standards, including the draft nitrogen objectives, widespread social and economic impacts will follow because these values are simply not attainable without greatly impairing water resources. Additional restrictions would likely need to be imposed on water transfers that occur following the first municipal or agricultural use of these supplies. The ability for the state economy to grow under these circumstances would be in jeopardy as federal rules would, for all practical purposes, prevent growth at existing facilities and the issuance of NPDES permits to new discharges.

The following actions, at a minimum, need to be undertaken to prevent these realities from occurring:

1. The adoption of TN requirements should be deferred pending a demonstration of actual environmental need and confirmation that attainment of stringent TN objectives would not cause more overall harm than good.

2. Stream water quality objectives on a stream segment specific basis should be tied to a demonstration that the nutrient of concern is causing a documented use impairment (*e.g.*, excessive plant growth beyond what would be expected under natural conditions). SAB recommendations on the factors to consider in setting scientifically defensible nutrient objectives need to be addressed. This should involve the development of a specific protocol that may be used for such assessments by the Division and regulated community.

3. Reservoir standards need to be evaluated on a case-by-case basis given the existing and planned uses of such waters. Plains reservoirs should not be forced to attain plant growth objectives applicable to foothill/mountain reservoirs given the dramatically different watershed and climactic conditions occurring at these sites. As with streams, a specific protocol needs to be established that will inform the public how impairment indicators will be derived and the methods for determining what nutrient parameters need to be regulated.

4. Reservoirs should be given first priority to have standards adopted. Where nutrient standards are adopted, and the water body is deemed impaired, TMDLs should be initiated to address all upstream sources, before any stream segment standards are deemed to be necessary.

5. A pre-TMDL permitting policy needs to be developed so that planned growth may be integrated with long-term pollution reduction goals. This policy would allow for increased flows and new permits to be issued so long as an overall decrease in the pollutant of concern occurs upstream of the impaired water.

6. The Division needs to clarify that long-term schedules of compliance will be allowed in implementing the nutrient objectives. Such schedules will (a) allow for the collection of additional data to refine criteria application in lakes, (b) study whether nutrient impairment in streams is occurring and is controllable, and (c) provide for the most cost-effective and sustainable approach to reducing nutrient loads from a wide range of point and nonpoint sources.

7. The Division needs to clarify how pollution trading programs may be used to allow for implementation of more cost-effective measures (both short and long term) and how such procedures may be used to allow long-term growth to occur pending completion of TMDL activities.

8. The Division needs to clarify the circumstances when variances and temporary modifications may be issued to address nutrient impairments associated with water transfer needs so that water resource opportunities are not impaired.

Appendix A

<u>Lake and Stream Nutrient Impairment Listings</u>

The recently adopted 303(d) list for 2010 includes the following impaired lakes and reservoirs for parameters that are often tied to nutrient over-enrichment:

North Sterling: DO and pH
Jackson: pH
Jumbo: pH
Barr and Milton: DO
Prospect Lake: DO, pH, NH3
Sloan's Lake: DO
Berkeley Lake: DO
Duck Lake: DO
Arvada Res: DO and Temperature
Sanchez Res: DO
La Jara Res: DO
Fruitgrowers Res: DO
Brush Hollow Res: DO
De Weese Res: DO
Stage Coach
Shadow Mountain

The monitoring list for DO is similar in length.

Two stream segments appear to be 303(d) listed:

Little Thompson River from source to Culver Ditch: DO and Temperature
Spring Creek on Colorado River: DO

There may be factors other than nutrients causing the DO sags. Thus, it is not apparent that any stream impairments are actually related to nutrients.

Appendix B

Overview of Nutrient Regulation in Various Lakes and Reservoirs

Chatfield Reservoir: Initial standards were adopted in 1984 to preserve existing uses close to 1982 conditions (total phosphorus at 14.6 ug/l). A Clean Lakes Study with little sampling data in November 1981 and October 1982 resulted in a goal for chlorophyll 'a' of 17 ug/l (within an acceptable range of 15-25 ug/l) and a site-specific total phosphorus standard of 27 ug/l to protect that chlorophyll 'a' goal, considering economic reasonableness.

The November 2009 rulemaking hearing changed the chlorophyll goal of 17 ug/l to a standard of 10 ug/l and changed the phosphorus standard from 0.027 mg/l to 0.030 mg/l, as measured by samples in the mixed layer during summer months of July, August, and September, with an exceedance frequency of once in five years. These revisions were due to measured exceedances of the phosphorus standard but not the chlorophyll goal. This demonstrated that where a mismatch between the two parameters occurs, the chlorophyll 'a' criteria should control decision-making.

"The Commission agreed that the linkages between the in-lake chlorophyll and total phosphorus concentrations and between total phosphorus concentrations and total phosphorus load to the reservoir are critical to the basis of the Control Regulation and the TMDL and that these linkages should be reviewed." (Reg # 73.17: 2009 Statement of Basis and Purpose.) The review found that median chlorophyll 'a' at 6 ug/l was much lower than anticipated from the typical phosphorous concentrations of 0.022 mg/l. The conventional regression (modified Jones-Bachmann equation) analysis used to originally set the standard and the goal was a weak linkage. Summer chlorophyll had greater variability than could be explained on the basis of summer phosphorus alone. A better linkage was created using a simple ratio of chlorophyll 'a' to phosphorus, which records the net responsiveness of the resident algal community to the amount of phosphorus present in the lake. It is a "net" value because it reflects the balance of growth (nutrients, light, temperature) and loss (grazing, washout, settling) processes.[9] The measured ratios offer an empirical basis for defining expectations for chlorophyll given the available phosphorus. The total phosphorus loading limit was reduced to19,600 lbs/yr under a median inflow of 100,860 ac/yr. Revisions to the wasteload allocations and load allocations have not yet occurred.

Cherry Creek Reservoir: The March 2009 rulemaking hearing changed the chlorophyll 'a' standard from15 ug/l to a seasonal standard of 18 ug/l to be attained four out of five

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[9] "[A] simulation model was used to develop exceedance probabilities for chlorophyll; a simulation model, rather than a regression approach, was necessary because chlorophyll is dependent on the phosphorus concentration, although there is considerable noise in the relationship. The simulation model yields a chlorophyll 'a' concentration of 9.7 ug/l for a one-in-five exceedance probability…The benefit of the simulation model resides largely in its capacity to unite chlorophyll 'a' and phosphorus in a common view of current trophic condition."(page 17) As shown in Figure 12 at page 16, that simulation model had an R^2 of 0.9995.

years. (The Basin Authority sought a new standard of 25 ug/l.) The prior standard of 15 ug/l was previously adopted in 2000 as a compromise between competing aquatic and recreational uses, pending significant data collection in recognition of the uncertainty of the relationship between chlorophyll ‘a’ and total phosphorus.

In 2009, the Commission concluded that the 15 ug/l standard could not feasibly be attained nine out of ten years. It was infeasible because the long term average of 10 ug/l which is necessary to attain the 15 ug/l would require a 30% reduction from the background levels of phosphorus monitored entering the reservoir. In light of the natural background phosphorus levels, which greatly exceeded the amounts necessary to attain 15 ug/l of chlorophyll a, it was infeasible to attain the 15 ug/l. Any additional practices to reduce total phosphorus would be exorbitantly expensive and it was unclear when and to what extent further reductions in phosphorus could be realized.

Meanwhile, the Cherry Creek Basin Authority continues watershed improvements. Since the 15 ug/l chlorophyll ‘a’ standard is not attainable, a standard of 18 ug/l is set as the maximum degree practicable standard. This is an interim standard that retains the goal of full protection of the Reservoir’s uses. The 18 ug/l is a long-term average based upon the prediction that 16.2 ug/l is the “most likely” chlorophyll concentration resulting from input of flow weighted phosphorus concentrations of 0.177 mg/l. This 16.2 ug/l is the 80^{th} percentile of a long term mean of the last five years.

<u>Bear Creek Reservoir</u>: On May 11, 2009, the Commission revised the site-specific narrative nutrient criteria to include numeric standards for chlorophyll ‘a’ and total phosphorus. Significant data has been collected since 1987 at the reservoir. The target condition to attain is between mesotrophic and eutrophic, but the reservoir is more productive than intended (eutrophic to hypereutrophic). This is despite significant reductions in external phosphorus loading since 1994, which includes effluent limits of 1.0 mg/l total phosphorus. Rather, the internal loading from past phosphorus discharges appears to have accumulated in the reservoir sediment and continues to increase during the summer months from 20 ug/l to 100 ug/l. It is anticipated that internal release will diminish over 10-15 years as sediment is flushed out.

Using a simple ratio of chlorophyll ‘a’ to phosphorus defines the site-specific responsiveness of the resident algal community to the availability of phosphorus. It is a “net” value, because it reflects the balance of growth (nutrients, light, temperature) and loss (grazing, washout, settling) processes. The chlorophyll standard of 10 ug/l is based upon the 80^{th} percentile of data related to the typical summer chlorophyll of 8 ug/l, as derived from a set of twelve Colorado lakes, each of which had been sampled in at least six years. The 10 ug/l chlorophyll ‘a’ standard is maintained by a standard of 32 ug/l of total phosphorus, with a one-in-five exceedance permitted. Testimony (EPA) for a larger ratio and thus a smaller phosphorus standard was found by the Commission to be unsupported by either statistical argument or mechanistic explanation.[10]

[10] Because the internal loading prevents attainment of the new numeric standards and it is uncertain how the new standards might be translated into point source permit limits, a Temporary Modification was adopted pending disappearance of the internal loading over time. Note that the reservoir's accumulated sediment reduced depth of the reservoir from 55 to 35 feet. Dredging is not an acceptable solution to Corps of Engineers.

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MEMORANDUM

Date: April 28, 2010

Subject: Department Comments on the Environmental Protection Agency's (EPA) Proposed Numeric Nutrient Criteria for Florida Lakes and Flowing Waters, January 26, 2010

To: Docket ID No. EPA-HQ-OW-2009-0596

From: Jerry Brooks, Director
Division of Environmental Assessment and Restoration

The Florida Department of Environmental Protection (Department) respectfully submits our comments on the January 26, 2010 Environmental Protection Agency (EPA) proposed numeric nutrient water quality criteria for the State of Florida's Lakes and Flowing Waters. Attached to this cover letter are numerous documents containing the Department's technical, legal, and policy evaluations of the proposed EPA action.

The Department evaluated the science behind the criteria and how that science was utilized in the expression of the criteria, including any implementation provisions. With that in mind, we evaluated the proposal to determine whether the criteria were established at levels necessary to protect the designated use of Florida's lakes and flowing waters. It is critically important that the criteria are correct. Criteria values that are more stringent than necessary result in forced investment of limited public (and private) dollars to develop site-specific alternative criteria, an activity that has no environmental benefit. In the absence of site specific criteria, overly stringent criteria forces significant investments for remediation with no associated environmental benefit. Criteria less stringent than necessary can result in failure to prevent environmental harm. Furthermore, the Department reviewed the science underlying the criteria to determine whether it was suitable to support adoption of the water quality standards, including whether appropriate regulatory provisions were included that recognize uncertainty in the analysis. The Department provided recommendations where improvements could be made based on our review.

1) Criteria for the Protection of Streams

The overarching issue related to the protection of streams is EPA's failure to account for natural features in the State that affect nutrient concentrations. The influence of the geologic Hawthorne formation on total phosphorus concentrations and the contributions of high levels of organic nitrogen to streams from wetlands are not accounted for in the EPA proposal. In evaluating unimpacted, largely natural streams in Florida against the proposed criteria thresholds, those that exceeded the criteria were either located proximal to the Hawthorne formation (a natural phosphorus bearing geologic feature) or dominated by the influence of wetlands as evidenced by the high water color and low dissolved oxygen content. It is illogical to establish criteria that are violated by natural features, and EPA should account for this in their final promulgated criteria to avoid implication of these features as pollutant sources.

The Department would also like to caution EPA against viewing occasional nonattainment of the currently adopted dissolved oxygen (DO) standard in Florida waterbodies as an indication of nutrient enrichment or biological harm. Most of our biologically healthy streams and lakes will exhibit low DO events during the course of the year. The Department has collected one years' worth of detailed biological and DO information and is continuing that collection effort with the intent of revising the currently adopted DO criteria to one that is more indicative of what is necessary to protect Florida's aquatic biology. Our attached comments contain some preliminary analysis of that data. Florida's DO criterion is based upon the EPA recommended 304(a) criteria and has not been adjusted to account for all the natural features that define Florida's unique diversity. Alternatively Florida has implemented the criterion, both in a regulatory context and assessment context, to recognize the influence of Florida's wetlands on dissolved oxygen. Our laws and regulations are structured to ensure that our programs do not force actions to correct natural conditions. With that in mind, we encourage EPA to focus more on the designated use attainment of streams as an indication of stream health rather than the DO condition of the stream.

It must also be acknowledged that the derivation of stream criteria was not based on a cause effect relationship. This is important as you move towards implementation of the criteria. EPA should acknowledge that attainment of the criteria would provide protection, but at the same time acknowledge that nonattainment of the criteria may not be an indication of designated use impairment. Given that uncertainty, EPA should include in its proposal an allowance for the evaluation of response variables, like chlorophyll *a* or biological monitoring.

2) Criteria for the Protection of Lakes

The Department appreciates the EPA's willingness to build your criteria proposal from the procedures proposed by FDEP, including the use of modified criteria. We think this is critically important when implementing criteria derived from a correlated relationship between nutrient concentrations and chlorophyll *a*. While the correlation was strong, there is still enough variability to demand the need for adjustments to the nitrogen and phosphorus variables in instances where they are not exhibiting an undesirable algal response.

The structure of EPA's proposed lake criteria results in a process that weakens Florida's surface water protection programs. Using EPA's structure, each time FDEP conducts assessments for lakes under paragraph 303(d) of the Clean Water Act, FDEP would become obligated to define the modified lakes criteria. This would happen every year for numerous lakes and would shift resources into assessment and reporting and away from monitoring, TMDL production, restoration activities, permitting, or other environmental programs. EPA should embrace the structure proposed by FDEP that acknowledges the variability of TN and TP from year to year and controls against an unacceptable number of annual excursions from the criteria. This structure is similar to many of our currently approved metals criteria that are based on hardness and does not impose a burdensome process for implementation.

The proposed rule for the protection of downstream lakes is inaccurate and unnecessary. The error associated with the total phosphorus loading results provided by the Vollenweider formula is too large to use as a water quality standard. The Vollenweider formula was derived using northern, deep lakes that do not exist in Florida, and a one size fits all formula does not work for the varying dynamics of the 7,000 lakes in Florida. The water quality models referred to in EPA's Technical Support Document would produce much fewer errors. Additionally, the assumption that zero phosphorus is attenuated in streams (i.e., that 100% of phosphorus in the headwaters reaches the lake) is not correct. This may occur over geologic timeframes considering geologic procedures, but it is not the intent of the Clean Water Act to govern natural geologic processes. Fortunately, the in-stream protection values offered by the Department provide inherent protection of downstream lakes making additional downstream protection values for lakes unnecessary. The Department requests that EPA reconsider their proposal to adopt a single formula to represent all lake conditions in Florida, acknowledge that the combination of lake and stream criteria meets the intent of the law, and let the other programs authorized by the Clean Water Act serve to ensure protection of both streams and downstream waters. Adoption of the proposed formula will result in excessive process for the establishment of site specific criteria because the formula does not reflect true lake water quality processes.

3) Criteria for the Protection of Estuaries

The Department is pleased that EPA recognizes the benefit of delaying these provisions until the necessary water quality targets for estuaries are known. We will continue to work with local scientists to develop these protective estuary values. However, it must be noted that downstream protection values for total nitrogen for the protection of estuaries are unnecessary because the in-stream protection values proposed by FDEP are inherently protective of the downstream estuaries. Additionally, the use of the SPARROW model in Florida does not produce accurate downstream protection values even if correct estuary loads are used. The SPARROW model is built upon a delineated stream network that is coarse and does not reflect the true hydrology of Florida. This results in significant error when projecting necessary nitrogen values upstream. The

SPARROW model also does not account for the influence of wetlands on total nitrogen values, which underestimates true nitrogen conditions of Florida streams. These types of errors produce faulty criteria that should not be adopted into federal regulations. Again the promulgation of criteria that does not reflect the true water quality dynamics of streams, rivers, lakes, and wetlands as water flows from them towards estuaries will demand unnecessary process that overall weakens the protection of Florida's surface waters.

4) Economic Cost Estimates

The cost estimates provided by EPA for the implementation of the criteria appear to significantly underestimate the costs to wastewater facilities, municipal separate storm sewer systems (MS4s), and agricultural sources. The Department has compiled the cost estimates from various parties and interests into one attached document for your use and consideration. It is possible that the EPA estimates are significantly less than those compiled by the Department because EPA has made assumptions about implementation. If EPA anticipates implementation actions that moderate the actions to achieve compliance with the proposed criteria, such actions should be clearly articulated.

5) Implementation

Of immediate concern is the effective date of the criteria. Assuming the promulgated criteria address the concerns expressed in our comments, only then can Florida take action to implement those criteria and such actions will take time. The proposed effective date of 60 days from promulgation is untenable. In order to properly implement the criteria after proposal, the Department will need to, at a minimum, adopt regulations for permitting and assessment (Impaired Waters Rule). The Department will also need to adopt the criteria and associated procedures for adoption of site specific criteria into rules. State law prohibits the Department from implementing policies or procedures that are not contained in rule. Given the administrative process for adopting rule changes, this may require two years dependent upon any resulting rule appeal. Without appeal the administrative process would take a minimum of one year. Until that occurs, the Department cannot implement the promulgated criteria in other Clean Water Act programs like permitting, water quality assessment, and total maximum daily loads.

Beyond the effective date issue, it will be very important for EPA to clearly define the Clean Water Act expectations for implementation. The true implications of the proposed criteria can only be established if there is clear understanding of what actions will be demanded upon promulgation. Additionally it will be important to clearly define how the criteria will be applied with regards to duration and frequency, including minimum time frames for long term averages and minimum data requirements.

The Department has made significant investments in the derivation of numeric nutrient criteria and the evaluation of how it should be implemented. We hope that our analysis and expertise is considered as you make decisions about the final promulgation of the criteria for the State.

JB/db/h

Attachments:

Appendix D. COLORADO STREAMS WITH TP > 0.1 mg/L and TN > 1.0 mg/L

SITE ID	LOCATION	BIOTYPE	MMI	TP mg/L	TN mg/L
I.	**SAMPLES WITH TP GREATER THAN 1.00 mg/L**				
5164	South Platte River Blw Clear Creek	3	24.59	2.62	11.075
5222	Big Dry Creek Nr Waltenberg	3	29.04	1.1	1
5223	Big Dry Creek d/s from Weld CR 4	3	44.1	1.1	1
5224	Big Dry Creek At I-25, d/s from Westminster	3	36.3	2.1	1
	Big Dry Creek WWTP				
5225	**Big Dry Creek d/s from Broomfield WWTP**	3	54.86	1.1	1
5314	Cache La Poudre River Blw Mishawaka	1	53.77	1.66	11
5602	Clear Creek at Tennyson	3	35.01	1.9	1.6
7263	Cripple Creek Abv Arequa Gulch	2	34.38	1.99	16
7293	Wildhorse Creek at Confl w/Arkansas River	3	44.5	1.9	
7301	Monument Creek at North Gate at AFA	1	20.44	2.42	0.655
7309	Sand Creek at Academy Blvd	3	2.78	2.2	25
103105	Fountain Creek at Pinon	3	53.07	2.7	1.3
103109	Fountain Creek Near Fountain, CO	3	21.52	1.12	
103113	Fountain Creek at Security, CO	3	18.97	1.31	
6720500	South Platte River at Henderson	3	27.57	1.1	6.1
6754000	South Platte River Near Kersey	3	43.56	1.26	8.5
9163500	Colorado River Nr CO/UT State Line	3	49.16	1.94	1.6
Cuchara	Cucharas River at Hwy 10	3	59.39	1.1	6.5
DDEH-N28	South Platte River 250m upst 19th Street	3	34.02	1.04	
DDEH-N34	South Platte River dnst Park Avenue,…	3	46.2	1.1	
DDEH-N41E	South Platte River at 36th Avenue…	3	30.69	1.05	
DDEH-N46	South Platte River 250 m dnst I-70	3	36.11	1.13	1
DDEH-N49	South Platte River at 50th Avenue	3	29.09	1.14	
DDEH-N49E	South Platte River at 50th Avenue	3	50.84	1.14	
DDEH-S20	South Platte River Immediately dnst Evans Avenue	3	38.93	1.62	1
DDEH-S25L	South Platte River at and upst Harvard Avenue	3	33.23	1.26	
GEI-11	South Platte Bridge Street From West Side of City Brighton	3	20.41	1.6	9.8
GEI-7	South Platte River	3	43.92	1.2	1.1
GEI-9	South Platte River at McKay Road Near Thornton, CO	3	17.69	1.9	10
M140	Big Thompson River	3	21.95	2.25	5.3
N28	South Platte Abv Cherry Creek From Intersection of I-25 &…	3	53.8	1.55	2.8
RW-209	South Platte Bridge Street From West Side of City Brighton	3	13.54	2.11	9.8

RW-213	South Platte 88th and Colorado From I-76 Near Town of…	3	20.66	1.02	
RW-238	North Fork Gunnison Below Paonia From Town of Delta	1	58.36	1.22	
RW-430	South Platte Bike Bridge From I-76 Near Adams City…	3	18.64	1.87	2.5
RW-451	Monument Creek N Gate of AFA From Junction of I-25 and US…	1	56.25	1.77	
RW-494	Boulder Creek Oxbow From Town of LaFayette	1	40.59	5.97	4.6
SACWSD-1	South Platte Above 104th	3	8.47	3.3	
SPR-1	South Platte River	3	10.78	1.01	
SPR-10	South Platte River at Fort Lupton, CO	3	22.08	1.8	9.6
SPR-3.5	South Platte Bike Bridge From I-76 Near Adams City…	3	9.58	2.05	6.6
SPR-4	South Platte River at McKay Road Near Thornton, CO	3	9.89	1.9	10
SPR-7	South Platte From West Side of City Brighton	3	23.31	1.82	
SPR-9	South Platte River upst of Big Dry Creek	3	25.61	1.8	5.3
WCOP01-722	South Platte River	3	13.67	2.23	12.963
WCOP01-724	South Platte River	3	9.05	2.62	11.075
WCOP99-594	Colorado River	3	23.06	3.96	3.325
II.	**SAMPLES WITH TP GREATER THAN 0.2 mg/L**				
34	Cleark Creek Near Mouth	3	35.57	0.26	1.4
5040	South Platte Snyder Bridge From Town of Snyder…	3	39.1	0.24	
5049	South Platte Riverside Pk From Junction of I072 &…	3	41.14	0.47	5.2
5208	Crow Creek Below Stroh Soccer Fields	3	22.13	0.46	
5253	Cherry Creek Below Stroh Soccer Fields	3	59.88	0.39	0.5
5254	Cherry Creek at Franktown at Hwy 86	1	55.97	0.42	0.5
5256	Cherry Creek at Prairie Canyon Ranch	3	47.59	0.49	0.54
5258	West Cherry Creek at Jones Road	3	40.76	0.2	0.66
5306	Cache La Poudre River Near Greeley	3	18.19	0.2	1.3
5501	St Vrain Creek u/s South Platte River at Gage	3	44.48	0.43	1
5504	St Vrain Creek below St Vrain Valley **WWTP**	2	57.22	0.42	
5511	St Vrain Creek Below Longmont **WWTP**	1	47.4	0.26	1.7
5571	Boulder Creek at 1650 Road	3	55.06	0.46	2.5
5572	Boulder Creek u/s Coal Creek near Gooding	1	33.23	0.54	1.8

5605	Clear Creek at Youngfield Street	3	32.35	0.68	0.77
5606	Clear Creek at I-70 Bridge	3	58.89	0.38	1.4
5934	South Platte River Below Brush Creek near Trumbull, CO	1	61.16	0.22	1.1
7250	Cripple Creek above Fourmile Creek	1	49.35	0.5	10
7306	Fountain Creek at Nevada Avenue	3	50.34	0.47	0.5
7336	16th Hold Valley Hi Golf Course	3	12.56	0.29	2.507
7390	Fountain Creek at Pueblo, CO	3	17.08	0.29	5.309
7501	Timpas Creek near Rocky Ford	3	42.36	0.28	
7650	Cucharas River Below Walsenburg at I-25	3	39.32	0.4	4
7701	Apishapa River near Fowler	3	39.99	0.2	0.92
8395	Rock Creek near Monte Vista	1	63.66	0.28	
10266	Mill Creek at TR 438 off 727 Rd	2	72.77	0.84	0.5
10325	Cochetopa Creek Above Dome Lakes	1	50.71	0.21	
10350	Razor Creek at 45 Road Bridge	1	48.04	0.38	0.75
10463	Roatcap Creek at Hwy 133	1	72.37	0.28	0.5
10672	Deer Creek at County Rd 8A	1	32.53	0.2	0.5
10980	Roc Creek near Mouth Above Dolores River	3	52.94	0.21	0.5
11874	Conway Draw at Gates of Ladore	1	14.39	0.29	0.5
12144	Troublesome Creek Above Confluence with East…	1	63.82	0.23	4.4
12709	Roaring Fork river Above Aspen	2	65.01	0.37	1
12761	Brush Creek at Mouth near Snowmass	1	65.99	0.82	1
103101	Fountain Creek at Pueblo, CO	3	17.31	0.78	5.5
110137	Monument Creek Above Woodmen Road at Colorado	3	34.13	0.77	
200091	Fountain Creek Below Janitell Road Below Colorado Springs	3	46.68	0.4	5.9
6714000	South Platte River at Denver	3	38.21	0.327	3.998
6731000	St Vrain Creek at Mouth near Platteville	3	51.01	0.4	3.9
6759910	South Platte river at Cooper Bridge near Balzac	3	47.55	0.34	4.1
9095500	Colorado River near Cameo	3	63.11	0.363	0.91
9149480	Dry Creek at Begonia Road near Delta	1	22.89	0.581	5
9152500	Gunnison River near Grand Junction	3	43.23	0.5	2.2
3935571	Dutch Creek - So Platte River Abv Littleton	1	41.55	0.46	2.1
3949211-5015701	Little Dry Creek Below Lowell Street near Westminster, CO	3	47.98	0.51	0.74
10271A	South Beaver Creek at powerline service rd	1	30.43	0.31	0.53
12502-A	Eagle River at Eagle Springs Golf Course	1	60.76	0.26	1.1
12502-E	Eagle River at Edwards	1	63.53	0.25	1
12761D	Brush Creek at Brush Creek Road	1	63.109	0.22	1.6

28A	Big Thompson River at 25 Rd d/s of Little Thompson	3	55.49	0.81	
5225a	Big Dry Creek	3	33.77	0.3	1.1
5252A	Cherry Creek at Ecological Park	2	51.59	0.38	0.5
5252B	Cherry Creek at Sulphur Gulch	3	44.15	0.47	0.5
5971a2	Trout Creek u/s of Confluence with West Creek	1	47.04	0.2	0.5
5971a5	Trout Creek u/s of Confluence with Rule	2	41.51	0.52	0.45
AR0028	Animas	1	68.75	0.3	1.2
ARBASIN	Animas	1	48.39	0.6	1.8
CU-BCNS	Brush Creek at Mouth near Snowmass	1	45.22	0.241	1.615
CU-NATN	Naturita Creek at Naturita	1	44.14	0.413	0.432
DDEH-E1	Cherry Creek d/s Lincoln Street; dwn pedestrian bridge	3	31.93	0.28	
DDEH-E10	Cherry Creek d/s Cornoa 100 m	3	33.05	0.26	
DDEH-E-12	Cherry Creek at and u/s Downing Street	3	38.79	0.25	
DDEH-E15	Cherry Creek Mid Denver CC GC; 6th fairway	3	39.05	0.25	
DDEH-E2	Cherry Creek d/s Grant Street	3	31.07	0.27	
DDEH-E24	Cherry Creek d/s University Blvd	3	18.78	0.27	
DDEH-E31	Cherry Creek u/s Clayton Street	3	37.08	0.27	
DDEH-E37	Cherry Creek u/s Alameda Avenue	3	32.45	0.28	
DDEH-E40	Cherry Creek d/s Colorado Blvd	3	29.47	0.29	1
DDEH-E42	Cherry Creek 200 m u/s Colorado Blvd	3	35.5	0.34	
DDEH-E6	Cherry Creek at Pearl Street	3	30.04	0.28	
DDEH-E70	Cherry Creek u/s Oneida Street	3	35.26	0.3	2
DDEH-N1	South Platte river 300m d/s Bayaud Ave	3	40.1	0.52	1
DDEH-N14	South Platte River d/s Lakewood Gulch	3	33.56	0.59	1
44.81	South Platte River d/s Colfax Avenue	3		0.6	
DDEH-N18L	South Platte River 75m d/s I-25 at invesco field	3	35.04	0.69	
DDEH-N19L	South Platte River 250m d/s I-25 overpass	3	11.54	0.56	
DDEH-N19LX	South Platte River 250m d/s I-25 overpass	3	20.7	0.68	
DDEH-N20L	South Platte River at Children's Museum dwn outfall	3	18.09	0.45	1.7
DDEH-N22LE	South Platte River at and d/s Ocean Jrny; east	3	9.55	0.5	
DDEH-N22LW	South Platte River at and d/s Ocean Jrny; west	3	26.55	0.49	
DDEH-N25	South Platte River at Cherry Creek Confluence; up mix west	3	34.98	0.55	1
DDEH-N25W	South Platte River at Cherry Creek Confluence; up mix west	3	50.3	0.55	
DDEH-	South Platte River 20m u/s 19th St;	3	40.03	0.46	

N29E	pre-Commons				
DDEH-N29W	South Platte River 20m u/s 19th St; pre-Commons	3	40.61	0.6	
DDEH-N30	South Platte River 1rst riffle d/s 20th St overpass	3	27.24	0.64	
DDEH-N30X	South Platte River at 20th St overpass	3	33.34	0.66	1
DDEH-N31	South Platte River dwn RR briged at inca	3	37.85	0.45	1.21
DDEH-N31K	South Platte River dwn 20th St overpass; dwn…	3	48.28	0.69	1
DDEH-N31W	South Platte River dwn hwy off ramp; dwn large…	3	22.11	0.53	
DDEH-N35	South Platte River u/s Denargo; d/s RR bridge	3	44.22	0.46	
DDEH-N36L	South Platte River u/s 29th Avenue	3	17.71	0.47	1
DDEH-N38L	South Platte River 250m d/s 31st Avenue	3	33.94	0.46	1
DDEH-N3L	South Platte River dwn 3rd Avenue; up drop	3	27.03	0.69	
DDEH-N40	South Platte River at 36th Avenue; west half at outfall on…	3	35.64	0.47	1
DDEH-N41	South Platte River at 36th Avenue; mix aone on east…	3	32.44	0.42	1
DDEH-N42	South Platte River at and d/s 38th Ave; west side	3	29.87	0.46	1.75
DDEH-N43	South Platte River at and d/s 38th Ave; east side	3	38.97	0.43	1.75
DDEH-N44	South Platte River d/s 38th Ave; dwn pedestrian bridge	3	32.17	0.34	1.04
DDEH-N44W	South Platte River d/s 38th Ave; dwn pedestrian bridge	3	37.56	0.35	1.04
DDEH-N48	South Platte River dwn 49th Avenue; dwn outfall	3	32.12	0.33	
DDEH-N4E	South Platte River at and d/s outfall at Vallejo Street	3	33.85	0.81	1
DDEH-N4W	South Platte River d/s outfall at Vallejo Street	3	36.47	0.6	1
DDEH-N50L	South Platte River 60m u/s Franklin St	3	38.34	0.33	2
DDEH-N6	South Platte River d/s 6th Avenue	3	37.99	0.55	
DDEH-N7L	South Platte River 100m u/s 8th Ave; u/s pedestrian…	3	30.11	0.5	
DDEH-S1	South Platte River u/s Bayaud; east side	3	50.17	0.91	
DDEH-S10L	South Platte River 60m d/s Mississippi Avenue	3	27.6	0.83	
DDEH-	South Platte River 270m d/s Florida;	3	27.89	0.92	1

S14L	u/s pedestrian…				
DDEH-S15	South Platte River u/s Florida Avenue; dwn drop	3	32.37	0.47	
DDEH-S17L	South Platte River 350m u/s Florida Ave	3	40.75	0.71	
DDEH-S19	South Platte River d/s Asbury; between bends	3	41.72	0.82	1.04
DDEH-S2	South Platte River d/s Alamdea Avenue 75m	3	35.09	0.97	
DDEH-S21LE	South Platte River u/s Evans; east side	3	40.04	0.84	2
DDEH-S21LW	South Platte River u/s Evans; west side	3	43.43	0.57	2
DDEH-S23	South Platte River d/s Harvard Gulch (E)	3	41.04	0.77	1.1
DDEH-S24	South Platte River d/s Harvard Avenue	3	45.92	0.78	1.1
DDEH-S25	South Platte River d/s Vassar Avenue; dwn LE **WWTP**	3	26.16	0.46	
DDEH-S3LE	South Platte River 125m u/s Alameda	3	32.54	0.71	
DDEH-S5L	South Platte River dwn Center Avenue	3	36.41	0.67	
DDEH-S7	South Platte River u/s Kalamath; dnst drop	3	36.5	0.5	
DDEH-S9	South Platte River d/s Tennessee Avenue	3	43.17	0.68	
DDEH-SR2	South Platte River u/s Church St 300m	1	52.11	0.44	0.5
DDEH-W1	Cherry Creek d/s Acoma; dwn spillway	3	22.69	0.25	0.56
DDEH-W10	Cherry Creek between 9th and 10th Ave	3	30.04	0.25	
DDEH-W11	Cherry Creek d/s 11th Avenue	3	39.14	0.21	
DDEH-W13N	Cherry Creek at and d/s 13th Avenue; north side	3	37.23	0.22	1
DDEH-W13S	Cherry Creek at and d/s 13th Avenue; south side	3	47.26	0.24	1
DDEH-W14	Cherry Creek d/s 14th Avenue	3	38.66	0.24	
DDEH-W15	Cherry Creek d/s Colfax Avenue	3	31.14	0.23	
DDEH-W16	Cherry Creek d/s Stout Street	3	37.45	0.24	
DDEH-W17	Cherry Creek d/s Champa Street	3	25.8	0.2	1
DDEH-W17X	Cherry Creek d/s Champa Street	3	31.12	0.22	
DDEH-W18	Cherry Creek d/s Arapahoe Street	3	29.06	0.22	
DDEH-W19	Cherry Creek d/s Market Street	3	35.63	0.21	

DDEH-W20	Cherry Creek d/s Blake Street	3	34.84	0.22	1
DDEH-W20X	Cherry Creek d/s Blake Street	3	29.94	0.21	
DDEH-W21	Cherry Creek d/s Delgany	3	36.02	0.21	
DDEH-W25	Cherry Creek u/s South Platte Confluence	3	37.65	0.22	1
DDEH-W9	Cherry Creek d/s 8th Avenue; d/s Bannock	3	40.57	0.24	
EPA02-CC01	Cherry Creek	1	66.03	0.42	0.5
GEI SE-1	Fountain Creek at 4th Street Bridge	3	8.67	0.53	0.5
GEI SE-2	Arkansas River Abv St Charles River at Hwy 233	3	45.02	0.37	
GEI SE-5	Arkansas River near Avondale, CO	3	21.95	0.31	3.6
GEI SE-6	Fountain Creek at Pinon Road Abv Pinon	3	34.5	0.25	
GEI-12	South Platte Bridge From West Side of City Brighton	3	30.28	0.211	7.4
GEI-5	South Platte River	3	46.3	0.7	1
GEI-6	South Platte River d/s Colfax Avenue	3	47.31	0.6	
GEI-8	South Platte River u/s Burlington Ditch	3	39.24	0.34	2
N18	South Platte River at 23rd Avenue	3	49.24	0.59	1.6
N34	South Platte River - N-351-W	3	39.59	0.53	1.2
N4	South Platte River	3	32.77	0.32	1
N46	South Platte River - N 46	3	36.46	0.2	1
RW-117	South Platte River Twin Br in Greeley, go W on Hwy 34 to 65th Ave	3	13.69	0.99	3.7
RW-207	Cache La Poudre River Near Greeley Poudre Windsor Br From Intersection of Main & 7th	3	59.06	0.54	
RW-423	St Vrain From Town of Hygiene, travel approx 3/4 mile	1	81.86	0.206	
RW-560	Colorado River Colorado Watson From US Hwy 6 in the Town of Grand	3	33.52	0.39	7
RW-661	Cherry Creek Below Cherry Creek Dam From the Intersection of…	3	30.73	0.22	0.5
S7	South Platte River d/s Tennessee Avenue	3	33.18	0.68	
SPR-2	South Platte River at 64th Avenue, Commerce City, CO	3	40.34	0.51	6.1
SPR-6	South Platte River at Henderson, CO	3	1.28	0.86	4.6
SV001	St Vrain From Town of Hygiene, travel approx 3/4 mile	1	57.45	0.206	
WCOP01-756	Big Dry Creek	3	49.93	0.748	6.3
WCOP01-768	South Platte River	3	6.01	0.998	7.213

WCOP99-671	South Platte River	3	35.78	0.404	3.575
III	**SAMPLES WITH TP GREATER THAN 0.1 mg/L**				
2	Arkansas River at Hwy 50 & 287 Bridge Near Lamar	3	28.32	0.12	1.8
61	Dolores River at Gateway	3	69.17	0.13	0.5
5005	South Platte Ovid From Intersection of US Hwy 138 & Main	3	51.92	0.13	3.4
5006	South Platte From I-76 E, exit Crook, Left turn after exit	3	21.82	0.108	3.7
5013	South Platte From Fort Collins take Hwy 14E, SW on Hwy 6	3	36.92	0.105	3.7
5030	South Platte From I-25 take Hwy 34 E, becomes Hwy 76E	3	39.13	0.117	1
5210	Sand Creek near Mouth	3	47.63	0.18	0.51
5242	Cherry Creek u/s of Bannock Street	3	21.91	0.19	0.56
5245	Cherry Creek u/s Glendate **WWTP**	3	32.95	0.13	0.5
5512	St Vrain Creek at Hygiene Road	1	55.31	0.12	0.5
5515	St Vrain Creek below Lyons 16th Hole Valley Hi Golf Course	1	69.21	0.14	
5570	Boulder Creek at Mouth	3	54.75	0.12	0.58
5708	South Platte River d/s Florida Street	3	31.09	0.17	1.6
5975	Twin Creek above Lake George	1	48.15	0.12	0.5
7252	Cripple Creek below Arequa Gulch	1	28.82	0.19	11.9
7370	Jimmy Camp Creek at Fountain, CO	3	41.38	0.14	0.5
7527	Steels Fork at Cty Rd 11	3	64.64	0.16	0.84
7620	Wahatoya Creek at Rd 358	3	41.99	0.19	0.5
8116	West Alder Creek	1	70.93	0.16	0.5
8138	Beaver Creek Tributary	2	67.32	0.13	
8148	Lime Creek Above FR 526	1	53.99	0.12	0.5
8155	South Clear Creek Below Browns Lake SWA	2	36.36	0.15	0.89
8355	Hot Creek at Hot Creek SWA	1	25.63	0.11	0.5
8629	South Fork Carnero Creek	1	67.62	0.16	0.5
10235	Willow Creek at 25 Rd West of Blue Mesa Lake Fork	1	47.5	0.17	
10282	Cebolla Creek at USGS Gage	1	70.02	0.11	0.358
10320	Cochetopa Creek near Mouth	1	32.53	0.17	0.5
10329	Stewart Creek at La Garita W.A.	2	34.21	0.16	
10634	Spring Creek at Spring Canyon Road	1	76.25	0.18	0.53
11345	Stinking Gulch near State Hwy 13 at Colorado/Wyo property near Hwy 13	1	54.71	0.15	0.8
12118	Big Alkali Creek at Mouth	1	48.65	0.17	1.1
12197	Fraser River Below Robbers C.G.	2	27.26	0.16	1
12556	Gore Creek at Mouth	2	72.78	0.13	
12805	Yampa River near Mount Harris Below	1	70.23	0.12	1.3

	Hwy 40 Bridge				
12853	Grassy Creek at Rd 27A	1	18.36	0.16	0.77
110121	Fountain Creek at Colorado Springs	3	36.18	0.13	0.5
6713500	Cherry Creek at Denver	3	41.98	0.147	2.9
8227000	Saguache Creek Near Saguache, CO	1	84.43	0.166	0.39
9153290	Reed Wash near Mack	3	39.17	0.148	1.6
39440910-5020501	Lakewood Gulch at mouth	3	42.51	0.11	1.1
40085510-5090501	Dry Creek Below Airport Road Near Longmont, CO	1	46.41	0.128	0.94
102F	Navajo river Above Chromo	1	64.9	0.11	0.5
125021	Eagle River Above Squaw Creek near Edwards	1	51.87	0.12	0.96
12503-D	Eagle River at Avon	1	69.16	0.11	1
12503-G	Eagle River Above Gore Creek	2	78.28	0.13	1
12732a	Coal Creek at mouth in Redstone	2	60.16	0.16	0.44
2B	Arkansas River at Hwy 50 & 287 Bridge near Lamar	3	30.74	0.12	1.8
5212a	Sand Creek Below Aurora Sand Creek **WWTP**	3	34.52	0.196	3.6
5226a	Big Dry Creek	3	32.95	0.12	1
5226b	Big Dry Creek	3	34.1	0.13	1
AR0018	Buffalo Creek at Hwy 385 N of Granada	3	41.63	0.137	2.8
Coal 30	Coal Creek	2	68.43	0.144	
CU-BTBE	Big Thompson River Below Estes Park	1	52.46	0.168	1.344
DDEH-E102	Cherry Creek d/s Cornell Avenue; dwn dry gulch	3	42.96	0.16	1
DDEH-E103	Cherry Creek Denver, dwn Havanna 1000 ft	3	31.41	0.17	
DDEH-E46	Cherry Creek d/s Cherry Street	3	20.22	0.12	1.2
DDEH-E53	Cherry Creek d/s Mississippi Avenue	3	39.09	0.13	1
DDEH-E59	Cherry Creek u/s Kearney Street	3	32.1	0.13	
DDEH-E63	Cherry Creek u/s Monaco Blvd	3	26.56	0.14	2
DDEH-E73	Cherry Creek d/s Quebec Street	3	42.22	0.16	
DDEH-E74	Cherry Creek 220m u/s Quebec Street	3	37.98	0.12	0.5
DDEH-E80	Cherry Creek d/s illif Avenue	3	37.67	0.15	
DDEH-ER3	Cherry Creek	3	41.91	0.13	1
DDEH-N21E	South Platte River Outfall To South Platte River at 23rd Avenue	3	31.59	0.13	1.3

DDEH-S26L	South Platte River Immediately u/s LE **WWTP**	3	45.59	0.17	
DDEH-S27L	South Platte River 250m u/s LE **WWTP,** dwn bend	3	51.21	0.17	
DDEH-S28	South Platte River 500m d/s Dartmouth, u/s	3	39.34	0.11	
DDEH-S30	South Platte River d/s Darthmouth Ave	3	44.67	0.12	3.575
DDEH-S30L	South Platte River 50m d/s Dartmouth Avenue	3	42.47	0.19	3.575
EPA02-SPR01	South Platte River From I-25 Take Hwy 34E, becomes Hwy 76E	3	26.85	0.117	
N Platte	North Platte River at CR 18 West of Walden, near Walden at SWA	1	62.86	0.11	0.2
NPS-3824	Blue Creek at Hwy 50 near Sapinero, CO	1	80.43	0.116	0.34
NPS-3827	Pine Creek at Hwy 50 near Sapinero, CO	1	55	0.196	0.12
NPS-3829	Steuben Creek North of Blue Mesa Reservoir	1	71.23	0.11	0.19
NPS-3830	West Elk Creek Below Forest Boundary near Sapinero	1	67.15	0.115	0.11
NPS-3834	Red Rock Canyon near NPS Boundary near Montrose	1	18.6	0.111	1.1
NPS-9127	Cimarron River Below Squaw Creek, Near Cimarron, CO	1	51.26	0.176	0.2
RW-257	South Platte River d/s Dartmouth Ave	3	14.48	0.19	
RW-433	San Miguel Norwood Hill From Town of Norwood	1	67.59	0.116	0.5
RW-610	Cheyenne Creek Canon School From Intersection of I-25 & US…	3	29.59	0.106	
RW-621	Big Thompson River -Big Thompson Glade Road Pk From Intersection of US…	1	20.52	0.12	
RW-727	Cherry Creek 11th & Speer From Intersection of I-25 & I-70	3	28.85	0.16	
S30	South Platte River	3	48.85	0.13	3.575
S51	South Platte River below Union Avenue at…	3	55.05	0.15	1.4
USFS-376014	Indian Creek at Toutt NF Boundary	2	79.16	0.18	0.53
USFS-381852	South Fork Arapaho Creek Above Confluence with MF	2	81.01	0.13	0.5
WCOP01-734	Salt Creek 1m Below Lil Burnt Mill Road	3	63.43	0.174	0.451
WCOP04-R010	Piceance Creek Above Confluence with Bear Gulch on Picenance SWA	1	26.04	0.111	0.602
WCOP99-501	North Fork Gunnison River	1	60.74	0.11	0.438

WCOP99-566	Dry Fork Piceance Creek	1	52.31	0.154	1.22
WCOP99-627	Houselog Creek	2	39.42	0.176	0.224
WCOP99-672	Purgatoire River 1 mi Above Confluence with Salt Arroyo	3	57.71	0.16	1.235