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COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

August 13, 2018

MEMORANDUM

TO: State Water Control Board Members

FROM: Jutta Schneider
Director, Water Planning Division

SUBJECT: **Request to Proceed to Public Comment and Hearing on Proposed Amendments to the Water Quality Standards Regulation (9VAC25-260): Numeric Chlorophyll-a Criteria for the Tidal James River and their Assessment Methodology**

Executive Summary

Staff will ask the Board for approval to go to public hearing and comment on amendments to the Water Quality Standards Regulation (9 VAC25-260-310 (bb)), regarding the numeric chlorophyll-*a* criteria applicable to the tidal James River. The proposed amendments are the outcome of the Department of Environmental Quality's (DEQ) seven-year-long effort to update the regulation with best available science, evaluating the protectiveness of the current criteria and determining if revisions were appropriate, as well as modifying the methods used to assess criteria attainment. In addition, an enhanced water quality model was developed to simulate chlorophyll concentrations in response to varying levels of point source nutrient reduction. Preliminary modeling scenarios have been run and results will be presented; however, more refined scenarios are still being processed to estimate the potential impact on the significant dischargers in the basin and their nutrient waste load allocations for total nitrogen and total phosphorus. The proposed amendments take into consideration the recommendations of a scientific advisory panel (SAP) and a regulatory advisory panel (RAP). A list of SAP and RAP membership is attached.

Background

Low dissolved oxygen (DO) is a problem found in much of the Chesapeake Bay and its tributaries. Excessive nitrogen and phosphorus pollution are well-established causes of algal

blooms, which can then lead to low DO. In 1999, EPA identified most of the waters of the Bay as impaired due to inadequate DO for aquatic life. This action spurred efforts to manage nutrient loads throughout the entire Bay watershed. The tidal James River poses a challenge since its physical characteristics make it resistant to low DO, yet it has experienced frequent and intense algal blooms that are occasionally comprised of potentially toxic phytoplankton. During development of the Chesapeake Bay Total Maximum Daily Load (TMDL), EPA urged Virginia to adopt chlorophyll-*a* criteria for the tidal James River so that nutrient loads in the James basin could be managed in a similar fashion as loads in other Bay tributary basins. Chlorophyll-*a* is the primary pigment of phytoplankton and is thus highly correlated with both phytoplankton biomass and nutrient levels. DEQ developed James River chlorophyll-*a* criteria in collaboration with the EPA-Chesapeake Bay Program Office and the Board adopted these criteria in 2005. Along with Bay-wide DO criteria and water clarity acreage goals for underwater grasses, the James River chlorophyll-*a* criteria were used as endpoints in EPA's Chesapeake Bay TMDL, which was finalized in December 2010.

The 2011 General Assembly directed DEQ to use up to $3 million from the Water Quality Improvement Fund (WQIF) to conduct the James River Chlorophyll-*a* Study, which was launched in response to concerns over the stringent nutrient allocations for the James River basin set by the Bay TMDL. The modeling framework used to develop the Bay TMDL determined that these allocations would be necessary to attain the chlorophyll-*a* criteria. Compliance with these allocations was estimated to add $0.5 to 1.0 billion over previous cost estimates of James River chlorophyll-a criteria attainment. The primary purpose of the James River Chlorophyll-*a* Study was to verify whether the potential impact on significant dischargers was justified by assessing the scientific defensibility of the criteria and their assessment methodology and developing alternatives if deemed necessary. DEQ's intention to review the regulation for this purpose was announced in a Notice of Intended Regulatory Action (NOIRA) published September 12, 2011. The Governor approved a waiver from the normal regulatory schedule to provide time to conduct a thorough study of the regulation.

Through the WQIF allocation, DEQ funded a number of scientific research projects to fill in knowledge gaps pertaining to estuarine nutrient dynamics, spatial and temporal distributions of James River chlorophyll-*a*, phytoplankton composition and dynamics, and harmful algal bloom toxicity. Another critical component of the study was the development of a water quality model specific to the James River, so that the full implications of the existing regulation and any amendments to it could be communicated to stakeholders. DEQ also convened a scientific advisory panel (SAP) comprised of university, private sector, and state/federal government scientists and experts to review this research and provide recommendations regarding the technical aspects of the criteria and assessment methodology. The regulatory advisory panel (RAP) formed for this regulatory action reviewed the SAP's recommendations and provided their own input on the criteria amendments. The RAP has also reviewed draft proposals presented by DEQ staff. DEQ staff has reasonably considered all the recommendations of the SAP and the RAP when developing the proposed amendments. EPA-Chesapeake Bay Program Office staff participated on both panels and engaged its Scientific and Technical Advisory Committee and Bay partner jurisdictions to provide additional input in the review process.

Current Proposal

The James River Chlorophyll-*a* Study revealed some substantial weaknesses in both the existing criteria and assessment methodology. First, the existing criteria were developed from datasets that were relatively limited in scope and that were drawn from areas of the Chesapeake Bay that may not be representative of the James River. In contrast, the proposed amendments provide criteria that were developed from larger, more refined datasets almost entirely developed within the tidal James. Secondly, while the existing criteria were developed to promote a balanced phytoplankton assemblage that is relatively free from harmful taxa, the absence of clear relationships between chlorophyll-*a* and phytoplankton composition necessitated some subjective decision-making in the selection of thresholds. In contrast, toxicity tests and robust statistical models were used to objectively inform all aspects of the proposed criteria. Furthermore, both physicochemical factors (dissolved oxygen, water clarity, and pH) and phytoplankton metrics were considered in the development of the proposed criteria, as opposed to just phytoplankton metrics. Thirdly, the study found that the existing criteria must be assessed as geometric means (as directed by implementation guidance referenced in subsection D of 9 VAC 25-260-185) even though they were developed as arithmetic means. Research conducted by EPA-Chesapeake Bay Program Office in 2010 determined that the geometric mean is the more appropriate statistic for characterizing James River chlorophyll-*a* central tendency. The proposed seasonal mean criteria were developed with this understanding. Finally, the existing assessment methodology and the rules used to delineate allowable exceedence frequency, described in references cited in subsection D of 9 VAC 25-260-185, were developed separately from the existing criteria and were found to be ill-suited for a parameter like chlorophyll-*a*, which can vary considerably in space and time even under ideal conditions. The mismatch between these elements and the existing criteria likely accounts for some of the stringency of the nutrient load reductions determined under the Bay TMDL by EPA to be necessary for criteria attainment. Another factor was the modeling framework used at the time had limitations in its ability to accurately predict chlorophyll concentrations resulting from simulated nutrient reduction scenarios. An enhanced model is now being used in the analysis with improved calibration and validity. The proposed amendments provide a procedure for analyzing data that is tailored to James River chlorophyll-*a* and is fully consistent with the way data were analyzed in the development of the proposed criteria. The proposed amendments stipulate allowable exceedence frequencies that are also consistent with the design of the proposed criteria.

9VAC 25-260-310 (bb) provides the criteria for site-specific chlorophyll-*a* levels in the tidal James River (excluding tributaries) and contains a table listing two seasonal mean criteria (spring and summer) for each of the five James River segments (delineated by salinity regime), for a total of ten paired sets of criteria. The proposal would amend each of the listed values, with eight values being lowered and two values being raised. Additionally, the proposal would insert another table of short-duration criteria that apply only during the summer. A James River segment would not be allowed to exceed these criteria more than 10% of the time. Compliance with the new criteria should minimize short-term effects of harmful algal blooms to aquatic life. The proposal also deletes the reference to subsection D of 9VAC25-260-185. Finally, the proposal would also insert new language stipulating the following:

- Seasonal mean criteria should be calculated as geometric means.
- The allowable exceedence frequency and length of assessment period over which criteria should be evaluated, along with the duration of those criteria.
- The manner in which chlorophyll-*a* data should be aggregated and how two of the segments should be subdivided for the purposes of data aggregation.
- A reference to the EPA technical document that provides the boundaries of the James River segments.

ATTORNEY GENERAL CERTIFICATION

These proposed amendments will be forwarded to the Office of the Attorney General for certification of the Board's authority to adopt them. The amendments will be proposed "contingent upon Attorney General Office statutory authority" if certification is not received by the September Board meeting.

PRESENTER CONTACT INFORMATION:

Presenter Name: John Kennedy and Tish Robertson
Presenter Office: Water Quality Standards
Telephone: 804-698-4312 (JK); 804-698-4309 (TR)
E-mail: john.kennedy@deq.virginia.gov; tish.robertson@deq.virginia.gov

Attachment 1: list of SAP and RAP memberships
Attachment 2: proposed amendments to **9 VAC 25-260-310 (bb)**
Attachment 3: Town Hall document

ATTACHMENT 1

SCIENTIFIC ADVISORY PANEL MEMBERSHIP

Clifton Bell Associate Hydrologist Brown and Caldwell 310 Bendix Rd Virginia Beach, VA 23452 (757) 518-2456 CBell@brwncald.com	**Brian Benham** Associate Professor and Extension Specialist Virginia Polytechnic Institute and State University Blacksburg, VA 24061 (540) 231-5705 benham@vt.edu
Claire Buchanan Director for Aquatic Habitats Interstate Commission of the Potomac River Basin 30 West Gude Drive, Suite 450 Rockville, MD 20850 (901) 984-1908 ext.112 CBuchanan@icprb.org	**Paul Bukaveckas** Associate Professor, Center for Environmental Studies Virginia Commonwealth University Richmond, VA 23284 (804)828-0161 pabukaveckas@vcu.edu
Todd Egerton Marine Scientist Supervisor 830 Southampton Ave, Suite 3100 Norfolk, VA 23510 (757)683-8461 todd.egerton@vdh.virginia.gov	**Greg Garman** **Director, VCU Rice Rivers Center** Virginia Commonwealth University Richmond, VA 23284 (804)828-0161 ggarman@vcu.edu
Will Hunley Environmental Scientist Hampton Roads Sanitation District 1434 Air Rail Ave Virginia Beach, VA 23455 (757)460-4252 whunley@hrsd.com	**Kenneth Moore** Professor Virginia Institute of Marine Science 1375 Greate Rd Gloucester Point, VA 23062 (804)684-7384 moore@vims.edu
Margaret Mulholland **Old Dominion University** 1 Old Dominion University Norfolk, VA 23529 (757)683-3972 mmulholl@odu.edu	**Kimberly Reece** Professor Virginia Institute of Marine Science 1375 Greate Rd Gloucester Point, VA 23062 (804) 684-7407 kreece@vims.edu
Peter Tango Chesapeake Bay Monitoring Coordinator Chesapeake Bay Program Office 410 Severn Ave, Suite 109 Annapolis, MD 21403 (443)510-0486 ptango@usgs.gov	**Harry Wang** Professor Virginia Institute of Marine Science 1375 Greate Rd Gloucester Point, VA 23062 (804)684-7215 wang@vims.edu

REGULATORY ADVISORY PANEL MEMBERSHIP

Ernie Aschenbach Biologist, Env. Services Section VA Department of Game and Inland Fisheries 7870 Villa Park Drive, Suite 400 Henrico, VA 23228 (804) 367-2733 Ernie.Aschenbach@dgif.virginia.gov	**Cheryl Atkinson** Water Quality Standards Coordinator EPA-Region III (3WP11) 1650 Arch Street Philadelphia, PA 19103-2029 (215) 814-3392 atkinson.cheryl@epa.gov
Richard Batiuk (upon retirement, replaced by Lucinda Power) Associate Director for Science Chesapeake Bay Program Office 410 Severn Ave, Suite 109 Annapolis, MD 21403 (410) 267-5722 power.lucinda@epa.gov	**Patrick Bradley** Water Quality Manager City of Richmond Department of Public Utilities 900 E. Broad St., Rm. 115 Richmond, VA 23219 (904) 646-7608 Patrick.Bradley@richmondgov.com
Jamie Brunkow Lower James Riverkeeper, James River Association 4833 Old Main St. Richmond, VA 23231 (757)634-4541 jbrunkow@jrava.org	**Jerry Byerly,** Director Hopewell Regional Wastewater Treatment Facility 231 Hummel Ross Rd Hopewell, VA 23860 (804)541-2214 ext. 204 jbyerly@hopewellva.gov
Darryl Glover Director, Div. of Soil & Water Conservation VA Department of Conservation and Recreation 600 E. Main St., 24th floor Richmond, VA 23219-2094 (904) 786-7119 darryl.glover@dcr.virginia.gov	**Dickie Thompson,** Deputy Director Hopewell Regional Wastewater Treatment Facility 231 Hummel Ross Rd Hopewell, VA 23860 (804) 541-2214 ext. 208 rthompson@hopewellva.gov
Robert Greenlee Eastern Regional Fisheries Mgr. VA Department of Game and Inland Fisheries 3801 John Tyler Memorial Hwy Charles City, VA 23030 (804) 829-6715 greenlee@dgif.virginia.gov	**Jamie Heisig-Mitchell** Chief of Technical Services Hampton Roads Sanitation District P.O. Box 5911 Virginia Beach, VA 23471-0911 (757) 460-4220 jmitchell@hrsd.com
Ted Henifin, President, VA Assoc. of Municipal Wastewater Agencies General Manager Hampton Roads Sanitation District P.O. Box 51 Richmond, VA 23218 (757) 460-4242 thenifin@hrsd.com	**Andrew Parker**, VA Manufacturers Association Health , Safety, and Environmental Leader AdvanSix 905 East Randolph Rd. Hopewell, VA 23860-2413 (804) 541-5734 Andrew.Parker2@honeywell.com
James Pletl, Director, Water Quality Dept. Hampton Roads Sanitation District 1434 Air Rail Ave Virginia Beach, VA 23430 (757) 460-4246 jpletl@hrsd.com	**Chris Pomeroy** President, AquaLaw (VAMWA legal counsel) 6 South 5th Street Richmond, VA 23219 (804) 716-9021, ext. 202 Chris@AquaLaw.com
Oula Shehab-Dandan, Environmental Consultant Dominion Resources Inc. 5000 Dominion Blvd. Glen Allen, VA 23060 (804) 273-2697 oula.k.shehab-dandan@dom.com	**Margaret Smigo**, Program Coordinator Virginia Department of Health/Waterborne Hazards Control 109 Governor St. Richmond, VA 23219 (804) 864-8128 margaret.smigo@vdh.virginia.gov
Keith Skiles, Director Virginia Department of Health-Division of Shellfish Sanitation 109 Governor St. Richmond, VA 23219 (804) 864-7477 keith.skiles@vdh.virginia.gov	**Robert Steidel** Deputy Chief Administrative Officer for Operations City of Richmond Department of Public Utilities 900 E. Broad St., Rm. 115 Richmond, VA 23219 (904) 646-1378 Robert.Steidel@richmondgov.com

Ellen Snyder, Virginia Manufacturers Association Environmental Engineer Altria Group, Inc. 6601 W. Broad St. Richmond, VA 23230 Ellen.Pafford.Synder@altria.com	**Barry Suits,** President Virginia American Water 22223 Duke St. Alexandria, VA 22314 (703) 706-3864 Barry.suits@amwater.com
Joseph Wood, PhD Virginia Staff Scientist, Chesapeake Bay Foundation 1108 E. Main St., Suite 1600 Richmond, VA 23219-3539 (804) 780-1392, ext. 3130 jwood@cbf.org	

ATTACHMENT 2

Part VII

Special Standards and Scenic Rivers Listings

9VAC25-260-310. Special standards and requirements.

The special standards are shown in small letters to correspond to lettering in the basin tables. The special standards are as follows:

a. Shellfish waters. In all open ocean or estuarine waters capable of propagating shellfish or in specific areas where public or leased private shellfish beds are present, including those waters on which condemnation classifications are established by the Virginia Department of Health, the following criteria for fecal coliform bacteria will apply:

The geometric mean fecal coliform value for a sampling station shall not exceed an MPN (most probable number) or MF (membrane filtration using mTEC culture media) of 14 per 100 milliliters (ml) of sample and the estimated 90th percentile shall not exceed an MPN of 43 per 100 ml for a 5-tube decimal dilution test or an MPN of 49 per 100 ml for a 3-tube decimal dilution test or MF test of 31 CFU (colony forming units) per 100 ml.

The shellfish area is not to be so contaminated by radionuclides, pesticides, herbicides, or fecal material that the consumption of shellfish might be hazardous.

b. Policy for the Potomac Embayments. At its meeting on September 12, 1996, the board adopted a policy (9VAC25-415. Policy for the Potomac Embayments) to control point source discharges of conventional pollutants into the Virginia embayment waters of the Potomac River, and their tributaries, from the fall line at Chain Bridge in Arlington County to the Route 301 bridge in King George County. The policy sets effluent limits for BOD_5, total suspended solids, phosphorus, and ammonia, to protect the water quality of these high profile waterbodies.

c. Canceled.

d. Canceled.

e. Canceled.

f. Canceled.

g. Occoquan watershed policy. At its meeting on July 26, 1971 (Minute 10), the board adopted a comprehensive pollution abatement and water quality management policy for the Occoquan watershed. The policy set stringent treatment and discharge requirements in order to improve and protect water quality, particularly since the waters are an important water supply for Northern Virginia. Following a public hearing on November 20, 1980, the board, at its December 10-12, 1980 meeting, adopted as of February 1, 1981, revisions to this policy (Minute 20). These revisions became effective March 4, 1981. Additional amendments were made following a public hearing on August 22, 1990, and adopted by the board at its September 24, 1990, meeting (Minute 24) and became effective on December 5, 1990. Copies are available upon request from the Department of Environmental Quality.

h. Canceled.

i. Canceled.

j. Canceled.

k. Canceled.

l. Canceled.

m. The following effluent limitations apply to wastewater treatment facilities treating an organic nutrient source in the entire Chickahominy watershed above Walker's Dam (this excludes discharges consisting solely of stormwater):

CONSTITUENT	CONCENTRATION
1. Biochemical oxygen demand 5-day	6 mg/l monthly average, with not more than 5% of individual samples to exceed 8 mg/l.
2. Settleable solids	Not to exceed 0.1 ml/l monthly average.
3. Suspended solids	5.0 mg/l monthly average, with not more than 5% of individual samples to exceed 7.5 mg/l.
4. Ammonia nitrogen	Not to exceed 2.0 mg/l monthly average as N.
5. Total phosphorus	Not to exceed 0.10 mg/l monthly average for all discharges with the exception of Tyson Foods, Inc., which shall meet 0.30 mg/l monthly average and 0.50 mg/l daily maximum.
6. Other physical and chemical constituents	Other physical or chemical constituents not specifically mentioned will be covered by additional specifications as conditions detrimental to the stream arise. The specific mention of items 1 through 5 does not necessarily mean that the addition of other physical or chemical constituents will be condoned.

n. No sewage discharges, regardless of degree of treatment, should be allowed into the James River between Bosher and Williams Island Dams.

o. The concentration and total amount of impurities in Tuckahoe Creek and its tributaries of sewage origin shall be limited to those amounts from sewage, industrial wastes, and other wastes which are now present in the stream from natural sources and from existing discharges in the watershed.

p. Canceled.

q. Canceled.

r. Canceled.

s. Canceled.

t. Canceled.

u. Maximum temperature for the New River Basin from Virginia-West Virginia state line upstream to the Giles-Montgomery County line:

The maximum temperature shall be 27°C (81°F) unless caused by natural conditions; the maximum rise above natural temperatures shall not exceed 2.8°C (5°F).

This maximum temperature limit of 81°F was established in the 1970 water quality standards amendments so that Virginia temperature criteria for the New River would be consistent with those of West Virginia, since the stream flows into that state.

v. The maximum temperature of the New River and its tributaries (except trout waters) from the Montgomery-Giles County line upstream to the Virginia-North Carolina state line shall be 29°C (84°F).

w. Canceled.

x. Clinch River from the confluence of Dumps Creek at river mile 268 at Carbo downstream to river mile 255.4. The special water quality criteria for copper (measured as total recoverable) in this section of the Clinch River are 12.4 µg/l for protection from chronic effects and 19.5 µg/l for protection from acute effects. These site-specific criteria are needed to provide protection to several endangered species of freshwater mussels.

y. Tidal freshwater Potomac River and tidal tributaries that enter the tidal freshwater Potomac River from Cockpit Point (below Occoquan Bay) to the fall line at Chain Bridge. During November 1 through February 14 of each year the 30-day average concentration of total ammonia nitrogen (in mg N/L) shall not exceed, more than once every three years on the average, the following chronic ammonia criterion:

$$\left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} \right) \quad x\ 1.45(10^{0.028(25-MAX)})$$

MAX = temperature in °C or 7, whichever is greater.

The default design flow for calculating steady state wasteload allocations for this chronic ammonia criterion is the 30Q10, unless statistically valid methods are employed which demonstrate compliance with the duration and return frequency of this water quality criterion.

z. A site specific dissolved copper aquatic life criterion of 16.3 µg/l for protection from acute effects and 10.5 µg/l for protection from chronic effects applies in the following area:

Little Creek to the Route 60 (Shore Drive) bridge including Little Channel, Desert Cove, Fishermans Cove and Little Creek Cove.

Hampton Roads Harbor including the waters within the boundary lines formed by I-664 (Monitor-Merrimac Memorial Bridge Tunnel) and I-64 (Hampton Roads Bridge Tunnel), Willoughby Bay and the Elizabeth River and its tidal tributaries.

This criterion reflects the acute and chronic copper aquatic life criterion for saltwater in 9VAC25-260-140 B X a water effect ratio. The water effect ratio was derived in accordance with 9VAC25-260-140 F.

aa. The following site-specific dissolved oxygen criteria apply to the tidal Mattaponi and Pamunkey Rivers and their tidal tributaries because of seasonal lower dissolved oxygen concentration due to the natural oxygen depleting processes present in the extensive surrounding tidal wetlands. These criteria apply June 1 through September 30 to Chesapeake Bay segments MPNTF, MPNOH, PMKTF, PMKOH and are implemented in accordance with subsection D of 9VAC25-260-185. These criteria supersede the open water criteria listed in subsection A of 9VAC25-260-185.

Designated use	Criteria Concentration/Duration	Temporal Application
Open water	30 day mean ≥ 4.0 mg/l	June 1 - September 30
	Instantaneous minimum ≥ 3.2 mg/l at temperatures <29°C Instantaneous minimum ≥ 4.3 mg/l at temperatures ≥ 29°C	

A site-specific pH criterion of 5.0-8.0 applies to the tidal freshwater Mattaponi Chesapeake Bay segment MPNTF to reflect natural conditions.

bb. The following site-specific seasonal mean criteria should not be exceeded in the specified tidal James River segment more than twice over six consecutive spring or summer seasons.

Designated Use	Chlorophyll-a µ/l	Chesapeake Bay Program Segment	Temporal Application
Open water	8	JMSTF2	March 1 - May 31 (spring)
	10	JMSTF1	
	13	JMSOH	
	7	JMSMH	
	8	JMSPH	
	21	JMSTF2	July 1 - September 30 (spring)
	24	JMSTF1	
	11	JMSOH	
	7	JMSMH	
	7	JMSPH	

The following site-specific chlorophyll-a concentrations at the specified duration should not occur more than 10% of the time over six consecutive summer seasons in the specified area of the tidal James River. These criteria protect against aquatic life effects due to harmful algal blooms. Such effects have not been documented in the upper portion of JMSTF2 or in JMSOH.

Chlorophyll-a µg/l	Chesapeake Bay Program Segment	Spatial Application	Duration
--	JMSTF2	Upstream boundary of JMSTF2 to river mile 95	--
52	JMSTF2	River mile 95 to downstream boundary of JMSTF2	1-Month median
52	JMSTF1	Upstream boundary of JMSTF1 to river mile 67	1-Month median
34	JMSTF1	River mile 67 to downstream boundary of JMSTF1	1-Month median
--	JMSOH	Entire segment	--
59	JMSMH	Entire segment	1-Day median
20	JMSPH	Entire segment	1-Day median

The ~~following~~above site specific numerical ~~chlorophyll a~~ chlorophyll-a criteria apply ~~March 1 through May 31 and July 1 through September 30 as seasonal means~~ to the tidal James River segments(excludes tributaries) ~~segments~~ JMSTF2, JMSTF1, JMSOH, JMSMH, and JMSPH ~~and are implemented in accordance with subsection D of 9VAC25-260-185.~~, the boundaries of which are described in EPA 903-R-05-004.

~~Designated Use~~	~~Chlorophyll a µ/l~~	~~Chesapeake Bay Program Segment~~	~~Temporal Application~~
~~Open water~~	~~10~~	~~JMSTF2~~	~~March 1 - May 31~~
	~~15~~	~~JMSTF1~~	
	~~15~~	~~JMSOH~~	
	~~12~~	~~JMSMH~~	
	~~12~~	~~JMSPH~~	
	~~15~~	~~JMSTF2~~	~~July 1 - September 30~~
	~~23~~	~~JMSTF1~~	
	~~22~~	~~JMSOH~~	
	~~10~~	~~JMSMH~~	
	~~10~~	~~JMSPH~~	

For segments JMSOH, JMSMH, and JMSPH, the median of same-day samples collected one meter or less in a segment should be calculated to represent the chlorophyll-*a* expression of a segment over that day, and the median of same-month chlorophyll-*a* values should be calculated to represent the chlorophyll-*a* expression of a segment over that month. The seasonal geometric mean shall be calculated from the monthly chlorophyll-*a* values for a segment.

For segment JMSTF2, chlorophyll-*a* data collected in the "upper zone"—from the upstream boundary (fall line) to approximately river mile 95 (N37° 23' 15.27"/W77° 18' 45.05" to N37° 23' 19.31"/W77° 18' 54.03")—should be pooled (in the manner described above) separately from chlorophyll-*a* data collected in the "lower zone"—from river mile 95 to the downstream boundary of JMSTF2. The seasonal geometric mean for each of these zones should be calculated from their respective monthly chlorophyll-*a* values. To calculate the seasonal segment-wide geometric mean, an area-weighted average of the zonal geometric means should be calculated using the following equation:

Upper Zone Geometric Mean x 0.41 + Lower Zone Geometric Mean x 0.59

For segment JMSTF1, chlorophyll-a data collected in the "upper zone"—from the upstream boundary of JMSTF1 to approximately river mile 67 (N37 17' 46.21"/W77 7' 9.55" to N37 18' 58.94"/W77 6' 57.14")—should be pooled (in the manner described above) separately from chlorophyll-a data collected in the "lower zone"—between river mile 67 to the downstream boundary of JMSTF1. The seasonal geometric mean for

each of these zones should be calculated from their respective monthly chlorophyll-a values. To calculate the seasonal segment-wide geometric mean, an area-weighted average of the zonal geometric means should be calculated using the following equation:

Upper Zone Geometric Mean x 0.49 + Lower Zone Geometric Mean x 0.51

cc. For Mountain Lake in Giles County, chlorophyll a shall not exceed 6 µg/L at a depth of six meters and orthophosphate-P shall not exceed 8 µg/L at a depth of one meter or less.

dd. For Lake Drummond, located within the boundaries of Chesapeake and Suffolk in the Great Dismal Swamp, chlorophyll a shall not exceed 35 µg/L and total phosphorus shall not exceed 40 µg/L at a depth of one meter or less.

ee. Maximum temperature for these seasonally stockable trout waters is 26°C and applies May 1 through October 31.

ff. Maximum temperature for these seasonally stockable trout waters is 28°C and applies May 1 through October 31.

gg. Little Calfpasture River from the Goshen Dam to 0.76 miles above its confluence with the Calfpasture River has a stream condition index (A Stream Condition Index for Virginia Non-Coastal Streams, September 2003, Tetra Tech, Inc.) of at least 20.5 to protect the subcategory of aquatic life that exists in this river section as a result of the hydrologic modification. From 0.76 miles to 0.02 miles above its confluence with the Calfpasture River, aquatic life conditions are expected to gradually recover and meet the general aquatic life uses at 0.02 miles above its confluence with the Calfpasture River.

hh. Maximum temperature for these seasonally stockable trout waters is 31°C and applies May 1 through October 31.

ATTACHMENT 3

townhall.virginia.gov

Proposed Regulation
Agency Background Document

Agency name	State Water Control Board
Virginia Administrative Code (VAC) citation(s)	9 VAC 25-260-310
Regulation title(s)	Water Quality Standards
Action title	Amendments to the tidal James River special standard for chlorophyll-a
Date this document prepared	

This information is required for executive branch review and the Virginia Registrar of Regulations, pursuant to the Virginia Administrative Process Act (APA), Executive Orders 17 (2014) and 58 (1999), and the *Virginia Register Form, Style, and Procedure Manual.*

Brief summary

Please provide a brief summary (preferably no more than 2 or 3 paragraphs) of the proposed new regulation, proposed amendments to the existing regulation, or the regulation proposed to be repealed. Alert the reader to all substantive matters or changes. If applicable, generally describe the existing regulation.

The proposed amendments includes modified and new site-specific chlorophyll-*a* criteria applicable to the tidal James River. Chlorophyll-*a* criteria enable watershed management of nitrogen and phosphorus, nutrients which drive algal blooms in the tidal James River. The proposed amendments are the result of a comprehensive scientific study overseen by DEQ that focused on chlorophyll-*a* dynamics and linkages to aquatic life effects in the James River. Among the most notable changes to the regulation are modified seasonal mean criteria (eight proposed criteria are lower than the existing criteria and two proposed criteria are higher) and new short-duration criteria that protect aquatic life from the effects of toxic algae. Additionally, new language describing how data should be analyzed and the allowable exceedence frequencies for both sets of criteria will be inserted into the regulation.

Acronyms and definitions

Please define all acronyms used in the Agency Background Document. Also, please define any technical terms that are used in the document that are not also defined in the "Definition" section of the regulations.

DEQ = Department of Environmental Quality
EPA = United States Environmental Protection Agency

Legal basis

Please identify the state and/or federal legal authority to promulgate this proposed regulation, including: 1) the most relevant citations to the Code of Virginia or General Assembly chapter number(s), if applicable; and 2) promulgating entity, i.e., agency, board, or person. Your citation should include a specific provision authorizing the promulgating entity to regulate this specific subject or program, as well as a reference to the agency/board/person's overall regulatory authority.

Section 62.1-44.15(3a) of the Code of Virginia, as amended, mandates and authorizes the State Water Control Board to establish water quality standards and policies for any State waters consistent with the purpose and general policy of the State Water Control Law, and to modify, amend or cancel any such standards or policies established. The federal Clean Water Act at 303(c) mandates the State Water Control Board to review and, as appropriate, modify and adopt water quality standards. The promulgating entity is the State Water Control Board.

The corresponding federal water quality standards regulation at 40 CFR 131.6 describes the minimum requirements for water quality standards. The minimum requirements are use designations, water quality criteria to protect the designated uses and an antidegradation policy. All of the citations mentioned describe mandates for water quality standards.

The Environmental Protection Agency (EPA) Water Quality Standards regulation (40 CFR 131.11) is the regulatory basis for the EPA requiring the states to establish water quality criteria to protect designated uses and the criteria are used to assess whether or not a waterbody is meeting those uses.

Purpose

Please explain the need for the new or amended regulation. Describe the rationale or justification of the proposed regulatory action. Describe the specific reasons the regulation is essential to protect the health, safety or welfare of citizens. Discuss the goals of the proposal and the problems the proposal is intended to solve.

The proposed amendments to the special standards and requirements section (9 VAC 25-260-310) of the Virginia Water Quality Standards Regulation reflects new understanding resulting from a seven-year-long study aimed at updating the chlorophyll-*a* criteria for the tidal James River with best available science. Chlorophyll-*a* criteria, which enable the regulatory management of nutrients (nitrogen and phosphorus), were adopted for the tidal James River in 2005. The scientific basis of the existing James River chlorophyll-*a* criteria was questioned in response to the stringent nutrient load reductions determined by the EPA to be necessary for attainment of these criteria.

The study of the existing regulation revealed some substantial weaknesses. First, the existing chlorophyll-*a* criteria were developed from datasets that were relatively limited in scope and were drawn from areas of the Chesapeake Bay that may not be representative of the James River. Secondly, while the existing criteria were developed to promote a balanced phytoplankton assemblage that is relatively free from harmful taxa, the absence of clear relationships between chlorophyll-*a* and phytoplankton composition necessitated some subjective decision-making in the selection of thresholds. Also, physicochemical effects stemming from algal blooms, like poor water clarity and high pH, were not considered when the existing criteria were developed. Thirdly, the study found that the existing criteria must be assessed as geometric means (as directed by implementation guidance specified in subsection D of 9 VAC 25-260-185) even though they were developed as arithmetic means. Research conducted by the EPA-Chesapeake Bay Program Office in 2010 determined that the geometric mean is the more appropriate statistic for characterizing James River chlorophyll-*a* central tendency. Finally, the existing assessment methodology and the rules used to delineate allowable exceedence frequency, both described in references cited in subsection D of 9 VAC 25-260-185, were developed separately from the existing criteria and were found to be ill-suited for a parameter like chlorophyll-*a*, which can vary considerably in space and time even under ideal conditions. The mismatch between these elements and the existing criteria likely accounts for some of the stringency of the nutrient load reductions determined by EPA under the Chesapeake Bay Total Maximum Daily Load (TMDL) to be necessary for criteria attainment. Another factor was the modeling framework used at the time had limitations in its ability to accurately predict chlorophyll concentrations resulting from simulated nutrient reduction scenarios. An enhanced model is now being used in the analysis with improved calibration and validity.

The proposed amendments to the regulation address the above weaknesses. DEQ staff have concluded that implementation of the proposed amendments will benefit the health, safety and welfare of the citizens of the Commonwealth by protecting the water quality and living resources of the tidal James River from the harmful effects of excessive nutrients.

Substance

Please briefly identify and explain the new substantive provisions, the substantive changes to existing sections, or both. A more detailed discussion is provided in the "Detail of changes" section below.

9 VAC 25-260-310 (bb) provides the criteria for site-specific chlorophyll-*a* levels in the tidal James River (excluding tributaries) and contains a table listing two seasonal mean criteria (spring and summer) for each of the five James River segments (delineated by salinity regime), for a total of ten paired sets of criteria. The proposed amendments would lower eight of these values and raise two of them. Compliance with these revised criteria should minimize both long-term and short-term effects on aquatic life attributable to algal blooms. Additionally, a new table of criteria that apply only during the summer would be inserted. Compliance with these new criteria should minimize short-term effects on aquatic life stemming from potentially toxic harmful algal blooms. Finally, the proposed amendments remove the reference to subsection D of 9 VAC25-260-185 and inserts new language stipulating that: 1) seasonal means should be calculated as geometric means; 2) the allowable exceedence frequencies of both sets of criteria and the length of the assessment period over which they should be evaluated; 3) the manner in which chlorophyll-*a* data should be aggregated and how segments should be subdivided for the purposes of data aggregation; and, 4) the reference to the EPA technical document that provides the boundaries of the James River segments.

Issues

Please identify the issues associated with the proposed regulatory action, including: 1) the primary advantages and disadvantages to the public, such as individual private citizens or businesses, of implementing the new or amended provisions; 2) the primary advantages and disadvantages to the agency or the Commonwealth; and 3) other pertinent matters of interest to the regulated community, government officials, and the public. If there are no disadvantages to the public or the Commonwealth, please indicate.

There are a number of advantages of the proposed amendments. First, DEQ will be able to better detect potentially harmful changes to the tidal James River stemming from excessive nitrogen and phosphorus loads that may affect the aquatic life designated use. DEQ will also be able to produce more confident assessments so that the public can be properly informed about the status of water quality in the tidal James River. Additionally, the proposed amendments strengthen the technical defensibility of the regulation so that the regulated community and resource managers can better understand the benefits expected to be gained with regulatory compliance. More defensible permit limits and non-point source management plans will result from the adoption of these amendments. A final benefit is that the costs needed to attain the proposed criteria may be less than what attainment of the existing criteria have been estimated to cost.

There is no disadvantage to the agency or the Commonwealth that will result from the adoption of this amendment.

Requirements more restrictive than federal

Please identify and describe any requirement of the proposal which is more restrictive than applicable federal requirements. Include a rationale for the need for the more restrictive requirements. If there are no applicable federal requirements or no requirements that exceed applicable federal requirements, include a statement to that effect.

The proposed amendments do not exceed applicable federal minimum requirements.

Localities particularly affected

Please identify any locality particularly affected by the proposed regulation. Locality particularly affected means any locality which bears any identified disproportionate material impact which would not be experienced by other localities.

The 38 counties and 17 cities that will be particularly affected all drain into the James River: Counties: Albemarle, Alleghany, Amelia, Amherst, Appomattox, Augusta, Bath, Bedford, Botetourt, Buckingham, Campbell, Charles City, Chesterfield, Craig, Cumberland, Dinwiddie, Fluvanna, Giles, Goochland, Greene, Hanover, Henrico, Highland, Isle of Wight, James City, Louisa, Montgomery, Nelson, New Kent, Nottoway, Orange, Powhatan, Prince Edward, Prince George, Roanoke, Rockbridge, Surry, and York; Cities: Buena Vista, Charlottesville, Chesapeake, Colonial Heights, Covington, Hampton, Hopewell, Lexington, Lynchburg, Newport News, Norfolk, Petersburg, Portsmouth, Richmond, Suffolk, Williamsburg, and Virginia Beach.

Regulatory flexibility analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency's analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) the establishment of less stringent compliance or reporting requirements; 2) the establishment of less stringent schedules or deadlines for compliance or reporting requirements; 3) the consolidation or simplification of compliance or reporting requirements; 4) the establishment of performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the proposed regulation.

Analysis not performed since no small businesses are affected.

Public participation

Please include a statement that in addition to any other comments on the regulation, the agency is seeking comments on the costs and benefits of the proposal, the potential impacts on the regulated community and the impacts of the regulation on farm or forest land preservation.

In addition to any other comments, the Board is seeking comments on the costs and benefits of the proposal, the potential impacts on the regulated community and on any impacts of the regulation on farm and forest land preservation. Also, the agency/board is seeking information on impacts on small businesses as defined in § 2.2-4007.1 of the Code of Virginia. Information may include 1) projected reported, recordkeeping and other administrative costs, 2) probable effect of the regulation on affected small businesses, and 3) description of less intrusive or costly alternative methods of achieving the purpose of the regulation.

Anyone wishing to submit written comments for the public comment file may do so by mail, email or fax to Tish Robertson, Office of Ecology, Department of Environmental Quality, P.O. Box 1105, Richmond, VA 23218, email: **tish.robertson@deq.virginia.gov**, phone: 804-698-4309, fax: 804-698-4116. Comments may also be submitted through the Public Forum feature of the Virginia Regulatory Town Hall web site at: **www.townhall.virginia.gov**. Written comments must include the name and address of the commenter. In order to be considered comments must be received by 5:00 p.m. on the date established as the close of the comment period.

A formal hearing will be held on a date and time and at a place to be determined if a request for a formal hearing is received by the contact person listed above within 30 days of publication of the notice of public comment period in the Virginia Register of Regulations.

Economic impact

Please identify the anticipated economic impact of the proposed new regulations or amendments to the existing regulation. When describing a particular economic impact, please specify which new requirement or change in requirement creates the anticipated economic impact.

Projected cost to the state to implement and enforce the proposed regulation, including: **a) fund source / fund detail; and** **b) a delineation of one-time versus on-going expenditures**	The projected cost to implement and enforce the proposed regulatory amendments should not cause any additional financial impact to the state. These amendments update existing rules, and while the staff may have to change the way water quality

	assessments are conducted, no additional staff or resources will be required to do this. The assessment program is funded by EPA 106 grants as well as State general fund budget.
Projected cost of the new regulations or changes to existing regulations on localities.	The 36 significant municipal and industrial wastewater facilities that discharge nutrients into the James River basin may have financial impacts due to implementation of revised nutrient wasteload allocations under the proposed regulatory amendments. However, based on preliminary water quality modeling results, the affected dischargers may have lower projected costs to comply with the proposed amendments when compared to estimated treatment levels needed to meet the existing regulation. Using order-of-magnitude cost estimation procedures, up to $172 million in capital costs may be incurred to upgrade these facilities with the technology needed to reduce nitrogen and phosphorus to the levels needed to achieve the proposed chlorophyll-*a* criteria. This is approximately 20% of the capital costs projected for compliance with the existing regulation, the stringency of which necessitates the treatment of wastewater nearing the limit of technology at every facility. Up to $27 million in additional annual operation and maintenance costs may be incurred. This is half the operation and maintenance costs projected for compliance with the existing regulation. The preliminary modeling results will be reviewed and revised as necessary upon completion of further modeling work. Simulations of more refined point source nutrient reduction scenarios are being processed to test compliance with the proposed chlorophyll criteria and to estimate the potential impact on the dischargers and their nutrient waste load allocations for total nitrogen and total phosphorus.
Description of the individuals, businesses, or other entities likely to be affected by the new regulations or changes to existing regulations.	Individuals, businesses, or other entities potentially impacted include point source permitted discharges; Publicly Owned Treatment Works treating domestic wastewater greater than 0.5 million gallons per day (MGD) with nitrogen and phosphorus in their discharge, and industrial facilities discharging an equivalent annual load of nutrients. This includes municipal sewage treatment plants, food processing (poultry and seafood), chemical and pulp and paper industries.
Agency's best estimate of the number of such entities that will be affected. Please include an estimate of the number of small businesses affected. Small business means a business entity, including its affiliates, that: a) is independently owned and operated and; b) employs fewer than 500 full-time employees or	25 significant municipal sewage/wastewater treatment plants 11 significant industrial dischargers 0 small businesses

has gross annual sales of less than $6 million.	
All projected costs of the new regulations or changes to existing regulations for affected individuals, businesses, or other entities. Please be specific and include all costs including: **a) the projected reporting, recordkeeping, and other administrative costs required for compliance by small businesses; and** **b) specify any costs related to the development of real estate for commercial or residential purposes that are a consequence of the proposed regulatory changes or new regulations.**	Compliance with the proposed chlorophyll-*a* criteria may necessitate up to $172 million in capital costs and up to $27 million in additional operation and maintenance costs for 25 significant municipal wastewater treatment plants. This is approximately 20% of the capital costs and 50% of the operation and maintenance costs projected for compliance with the existing regulation, the stringency of which necessitates the treatment of wastewater nearing the limit of technology at all affected dischargers. The 11 significant industrial dischargers that would be affected may incur up to a $52 million in capital costs and up to $3 million in additional operation and maintenance costs. These projected costs are approximately 50% of the costs projected for the existing regulation. These point source cost estimates represent order-of-magnitude planning cost estimates (-30% to +50%). More accurate costs can only be derived through specific facility planning, design and ultimately construction bids for the treatment upgrades. It is not expected that the amendments will affect reporting, recordkeeping, or other administrative costs.
Beneficial impact the regulation is designed to produce.	The proposed amendments makes the regulation more scientifically defensible, easier to implement, and will result in more confident assessment results.

Alternatives

Please describe any viable alternatives to the proposal considered and the rationale used by the agency to select the least burdensome or intrusive alternative that meets the essential purpose of the action. Also, include discussion of less intrusive or less costly alternatives for small businesses, as defined in § 2.2-4007.1 of the Code of Virginia, of achieving the purpose of the regulation.

There were two alternatives considered by DEQ staff and discussed with the regulatory advisory panel:

- Whether a three-year or six-year water quality monitoring data period should be used to conduct assessments of the chlorophyll-a criteria. As with Chesapeake Bay dissolved oxygen and submerged aquatic vegetation assessments, the existing chlorophyll-*a* criteria are evaluated over a three-year period. With a three-year period, only one exceedence of either of the seasonal mean criteria would be allowed in a segment. Toxic parameters like ammonia are assessed with a similar rule. The advantage of a shorter period is that impairment can be detected more rapidly. However, DEQ staff decided that a six-year assessment period would enable more confident assessments since a wider range of conditions would be observed. This additional confidence also extends to the assessment of water quality modeling results. Moreover, since chlorophyll-*a* 1) is not a toxic pollutant, 2) is not a direct stressor of aquatic life, and 3) can be sporadically elevated for reasons unrelated to human activity, DEQ staff believe that a shorter period may be

overly restrictive. DEQ uses a six-year water quality monitoring data period for assessments of most conventional pollutants in most of the surface waters of the Commonwealth. A disadvantage of a six-year assessment period is that two consecutive seasonal mean criteria exceedences would be allowed. Concerns were expressed by a RAP member that this could have implications on aquatic life recovery.

- Whether chlorophyll-a criteria should be expressed as only seasonal means or as seasonal means and shorter-term, upper threshold values not to be exceeded more than 10% of the time. The proposed seasonal mean criteria were developed to protect against the long-term and short-term harmful effects of algae on aquatic life, so it can be argued that additional criteria are not needed. However, DEQ staff decided that incorporating both sets of criteria would limit the magnitude of seasonal mean exceedences and further minimize the frequency of potentially harmful algae blooms. DEQ staff also decided that the short-duration criteria would minimize any harmful effects resulting from consecutive seasonal mean exceedences, since the magnitude of seasonal mean exceedences are constrained when the short-duration criteria are attained.

Regulatory flexibility analysis

Pursuant to § 2.2-4007.1B of the Code of Virginia, please describe the agency's analysis of alternative regulatory methods, consistent with health, safety, environmental, and economic welfare, that will accomplish the objectives of applicable law while minimizing the adverse impact on small business. Alternative regulatory methods include, at a minimum: 1) the establishment of less stringent compliance or reporting requirements; 2) the establishment of less stringent schedules or deadlines for compliance or reporting requirements; 3) the consolidation or simplification of compliance or reporting requirements; 4) the establishment of performance standards for small businesses to replace design or operational standards required in the proposed regulation; and 5) the exemption of small businesses from all or any part of the requirements contained in the proposed regulation.

Dischargers that are not able to meet the permit limits resulting from the proposed amendments may request a compliance schedule or a water quality standards variance.

Public comment

Please summarize all comments received during the public comment period following the publication of the NOIRA, and provide the agency response.

Commenter	Comment	Agency response
Virginia Manufacturers Association (VMA)	Request to be represented on the regulatory advisory panel	VMA is represented on the regulatory advisory panel
Virginia Association of Municipal Waterwater Agencies, Inc.(VAMWA)	Request to be represented on the technical advisory panel	VAMWA is represented on both the scientific and regulatory advisory panels.
Chesapeake	Request to be represented on the	CBF is represented on the regulatory advisory

Bay Foundation (CBF)	regulatory advisory panel. DEQ should more clearly define the roles of the scientific advisory panel (SAP) and regulatory advisory panel. DEQ should commit to submitting the key work of the SAP to the Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC).	panel. The scientific advisory panel focused solely on the technical concerns of the criteria, whereas the regulatory advisory panel discussed both technical and policy concerns, including economic impacts. DEQ submitted the SAP's final report to STAC for peer review, and subsequently submitted the agency's proposal as well.
James River Association (JRA)	Request to be represented on the regulatory advisory panel. DEQ should expand the scope of the James River chlorophyll-*a* study to determine linkages between chlorophyll-a and human health/ aquatic health impacts and chlorophyll-a and bacteria, clarity, and toxicity. The study plan should include additional monitoring sites and phytoplankton sampling (of toxin and non-toxin producing species). There should also be a greater role for EPA on the scientific advisory panel. DEQ should commit to submitting the key work of the SAP to the Chesapeake Bay Program's Scientific and Technical Advisory Committee (STAC).	JRA is represented on the regulatory advisory panel. The James River Chlorophyll-*a* Study explored most of the linkages the commenter mentioned (aquatic life health, clarity, and toxicity). Human health impacts were not explored since the levels of potentially toxic algae found in the tidal James are not generally high enough to be of concern to human health. However, microcystin levels in James River blue crabs were analyzed by DEQ staff and assessed in the context of human health. The risk to human health was found to be low. Linkages between chlorophyll-*a* and bacteria were not explored since bacteria loads are not necessarily tied to nutrient enrichment. Monitoring efforts were expanded considerably during the course of the study, with significant attention placed on phytoplankton and algal toxin sampling. The EPA-Chesapeake Bay Program Office is represented on both the scientific and regulatory advisory panels. DEQ submitted the SAP's final report to STAC for peer review, and subsequently submitted the agency's proposal as well.

Family impact

Please assess the impact of this regulatory action on the institution of the family and family stability including to what extent the regulatory action will: 1) strengthen or erode the authority and rights of parents in the education, nurturing, and supervision of their children; 2) encourage or discourage economic self-sufficiency, self-pride, and the assumption of responsibility for oneself, one's spouse, and one's children and/or elderly parents; 3) strengthen or erode the marital commitment; and 4) increase or decrease disposable family income.

The proposed regulatory action may decrease the disposable family income as localities and industrial dischargers upgrade their treatment facilities and pass the increased water and sewer costs to ratepayers and consumers.

Detail of changes

Please list all changes that are being proposed and the consequences of the proposed changes; explain the new requirements and what they mean rather than merely quoting the proposed text of the regulation.

If the proposed regulation is a new chapter, describe the intent of the language and the expected impact. Please describe the difference between existing regulation(s) and/or agency practice(s) and what is being proposed in this regulatory action. If the proposed regulation is intended to replace an emergency regulation, please follow the instructions in the text following the three chart templates below.

For changes to existing regulation(s), please use the following chart:

Current section number	Proposed new section number, if applicable	Current requirement	Proposed change, intent, rationale, and likely impact of proposed requirements
9VAC 25-260-310		Contains site-specific and effluent criteria for various water bodies	Deletes reference to subsection D of 9 VAC25-260-180 and adds reference to the EPA document that describes the Chesapeake Bay segment boundaries. Adds language stipulating how chlorophyll-*a* data should be aggregated in time and space. Modifies seasonal mean criteria, lowering eight and raising two. Inserts new table of criteria that apply only during summer. Provides the allowable exceedence frequencies and assessment periods for both sets of criteria.