July 17, 2023

U.S. Environmental Protection Agency
Administrator Michael Regan
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

EPA New England, Region 1
Regional Administrator David Cash
5 Post Office Square - Suite 100
Boston, MA 02109-3912

RE: Notice of Intent to Sue Letter—Massachusetts Water Quality Standards

Dear Administrator Regan and Regional Administrator Cash,

This letter provides notice of the intent of Ipswich River Water Association ("IRWA"), the Parker River Clean Water Association ("PRCWA"), and the Massachusetts Rivers Alliance ("Mass Rivers") to file suit against you in your official capacities as Administrator and Regional Administrator of the United States Environmental Protection Agency ("EPA") (hereinafter, collectively "EPA"). The basis for this suit is EPA's failure to review the Massachusetts Water Management Act ("WMA"), Mass. Gen. Laws Ch. 21G, § 1 *et seq.*, and its implementing regulations, 310 Code of Massachusetts Regulations ("CMR") §§ 36.01–36.44, for consistency with applicable requirements of the Clean Water Act ("CWA" or "the Act"), in violation of Section 303(c) of the Act. 33 U.S.C. § 1313(c). Section 303(c) imposes a non-discretionary duty on EPA to review any state law that has the effect of modifying state water quality standards ("WQS") or creating new ones. *Id.* EPA has the authority and obligation to approve or disapprove such laws. *Id.*

Regulation of water quantity, including instream flows, has a substantial effect on water quality; water quantity and quality are inextricably linked under the CWA. The WMA and its implementing regulations redefine the desired condition of Massachusetts' waters by, *inter alia*, establishing a new Safe Yield criterion and new stream flow criteria that, in effect, create new biological criteria. These new criteria were developed to protect water quality and existing and designated uses, although, as set forth below, they are failing to do so resulting in significant adverse ecological consequences to Massachusetts' waters. These laws and regulations meet the definition of "new or revised WQS" under case law and EPA guidance. As such, EPA has a non-discretionary duty to review them for consistency with the CWA.

As detailed below, these criteria are not based on a sound scientific rationale,[1] do not protect the state's designated uses,[2] and do not provide for the attainment and maintenance of downstream WQS.[3] In fact, these criteria—which though not submitted to EPA for review, by their own terms are categorically incompatible with the CWA—have contributed to Massachusetts designating dozens of waterbodies as impaired for dewatering and the non-attainment of designated uses as documented by the Massachusetts Department of Environmental Protection ("MassDEP") in the State's CWA Integrated Report.

As such, EPA review will show that Massachusetts' Safe Yield laws and regulations[4] and streamflow criteria regulations[5] are inconsistent with the requirements of the CWA. Thus, EPA should disapprove these laws and specify for Massachusetts the changes necessary to meet the CWA's applicable requirements. Such an action would be consistent with EPA's recent disapproval of similar WQS regulations in South Carolina. If EPA does not discharge its non-discretionary duty under Section 303(c) to review, and approve or disapprove, these regulations within 60 days of the postmark date of this letter, IRWA, PRCWA, and Mass Rivers intend to file suit to compel EPA to do so pursuant to CWA § 505(a)(2), 33 U.S.C. 1365(a)(2). As directed by 40 C.F.R. § 135.2, a copy of this notice is being sent to the Attorney General of the United States and MassDEP.

[1] 40 C.F.R. § 131.5(a)(2).
[2] 40 C.F.R. § 131.11(a)(2).
[3] 40 C.F.R. § 131.10(b).
[4] MASS. GEN. LAWS ch. 21G, §§5, 7; 310 CMR 36.13.
[5] 310 CMR. 36.14.

I. Parties Giving Notice

The organizations sending this notice have a direct interest in maintaining and enhancing water quality in Massachusetts' waters, in seeing that Massachusetts' WQS are met, and in ensuring that EPA fulfills its statutorily-mandated review and oversight of Massachusetts WQS.

IRWA is a 501(c)(3) nonprofit organization located in Ipswich, MA.[6] IRWA's members are residents, scientists, businesses, and community leaders concerned about the health of the Ipswich River and its watershed. IRWA aims to maintain clean, reliable water for people and wildlife in the watershed. To pursue these goals, IRWA advocates for prudent federal, state, and local water management and conducts a number of monitoring, restoration, and educational programs geared toward its members and the larger community. Rivers and streams in the Ipswich River watershed are directly and negatively impacted by Massachusetts' new or revised WQS and EPA's failure to review them.

PRCWA is a 501(c)(3) nonprofit organization located in Byfield, MA.[7] PRCWA works to protect and restore the waters and ecosystems of the Parker River and Plum Island Sound watersheds for current and future generations. PRCWA aims to preserve and protect the river through the development of community-based objectives and coalitions. PRCWA also focuses efforts on a series of objectives, including public outreach for education and volunteers, technical assessment of the river and its ecosystem, and organizational development of a strong watershed group.

Mass Rivers is a 501(c)(3) nonprofit organization located in Somerville, MA.[8] Mass Rivers works to strengthen statewide river policies in four areas: water quality, streamflow, wildlife habitat, and green infrastructure. To that end, Mass Rivers advocates for improvements in state laws and policies that improve drought resiliency, reform water allocation policies, and update state water conservation standards. Further, Mass Rivers, an alliance with over 80 member organizations, works with members and partner organizations to restore water quality through better permitting and enforcement of stormwater regulations, public outreach, education, and technical assistance for municipalities.

In addition, members, staff, and volunteers of IRWA, PRCWA, and Mass Rivers work, fish, recreate, and pursue spiritual practice in and around the State's waters. These interests are adversely affected by the new or revised WQS addressed herein, and EPA's failure to review them.

IRWA, PRCWA and Mass Rivers are represented by:

Kevin Cassidy

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[6] *See* Ipswich River Watershed Association, https://www.ipswichriver.org/ (last visited June 29, 2023). IRWA is located at 143 County Rd, Ipswich, MA 01938, and its phone number is (978) 412-8200.
[7] *See* Parker River Clean Water Association, http://www.parker-river.org/ (last visited June 29, 2023). PRCWA is located at PO Box 798, Byfield, MA 01922, and its phone number is (978) 462-2551.
[8] *See* Massachusetts Rivers Alliance, https://www.massriversalliance.org/ (last visited June 29, 2023). Mass Rivers is located at 11 Curtis Avenue, Somerville, MA 02144, and its phone number is (617) 714-4272.

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II. EPA's Mandatory Duty to Review Massachusetts' New or Revised WQS

The Clean Water Act requires that EPA exercise a non-discretionary duty to review new or revised WQS under § 303(c)(3). Having determined that a provision is a new or revised WQS, EPA reviews the WQS provisions for consistency with the CWA and EPA's implementing regulations. As such, EPA must undertake a two-step analysis: first, determine whether the WMA and implementing regulations are new or revised WQS (a determination that includes whether they are WQS at all), and second, to determine whether the WMA and implementing regulations are substantively consistent with the CWA. As detailed below, EPA should find that the WMA and implementing regulations are new or revised WQS and that they are inconsistent with the CWA.

A. The Water Management Act and its implementing regulations are WQS under the CWA.

The WMA and implementing regulations are WQS under § 303(c) of the CWA because (1) they designate uses for water bodies and (2) set criteria to protect those uses.

EPA, in finding that the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act of 2010 and accompanying regulations constituted new WQS that required review, cogently defined WQS. According to EPA:

> WQS articulate the water quality goals of a water body by designating the use(s) and setting the criteria to protect those use(s). States adopt WQS to protect public health, enhance the quality of water, and serve the purposes of the CWA. WQS provide water quality for the protection and propagation of fish, shellfish and wildlife and recreation in and on the water, wherever attainable, and take into consideration the use and value of waters for public water supplies, agricultural, industrial, and other purposes including navigation. *See* 40 CFR section 131.2. Criteria are defined as elements of WQS "expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use." 40 CFR section 131.3(b).[9]

Like the EPA-disapproved South Carolina law and regulations, the WMA and MassDEP regulations similarly articulate designated uses and criteria to protect those uses:

[9] U.S. ENV'T PROT. AGENCY, REGION 4, Opinion Letter on the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act of 2010 1 (May 20, 2022) (attached as Exhibit A) [hereinafter "EPA Opinion Letter"].

> The commission shall adopt principles, policies and guidelines necessary for the effective planning and management of water use and conservation in the commonwealth and for the administration of this chapter as necessary and proper *to ensure an adequate volume and quality* of water for all citizens of the commonwealth, both present and future. Such principles, policies and guidelines *shall be designed to protect the natural environment of the water in the commonwealth*; to assure comprehensive and systematic planning and management of water withdrawals and use in the commonwealth, recognizing that water is both finite and renewable; and to allow continued and sustainable economic growth throughout the commonwealth and increase the social and economic well being and safety of the commonwealth's citizens and of its work force.[10]

The WMA and implementing regulations articulate the purpose to protect public health ("necessary and adequate to protect the public health, safety and welfare")[11] and enhance water quality ("[t]he commission shall adopt principles, policies and guidelines necessary … for the administration of this chapter as necessary and proper *to ensure an adequate volume and quality* of water for all citizens […]").[12]

Moreover, the WMA requires, in establishing criteria and standards for issuing water withdrawal permits, that MassDEP "shall assure, at a minimum" consideration of factors that include protection of water quality for "[r]easonable protection of *public drinking water supplies, water quality,* wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, *water-based recreation, wetland habitat, fish and wildlife*, agriculture, and flood plains," among other considerations.[13] These considerations further prove that the WMA establishes WQS:

> Section 7. The department shall, by regulation, specify, for each water source from which withdrawals are to be permitted, a date upon which its regulations *establishing criteria, standards and procedures for issuing permits* shall become effective . . .
>
> *In adopting regulations establishing criteria and standards for obtaining permits*, the department shall assure, at a minimum, that the following factors are considered:—
>
> > (1) *The impact of the proposed withdrawal on other water sources* which are hydrologically interconnected with the water source from which the withdrawal is to be made;
> >
> > (2) The anticipated times of year when withdrawals will be made;
> >
> > (3) The water available within the safe yield of the water source from which the withdrawal is to be made;

[10] MASS. GEN. LAWS ch. 21G, § 3 (emphasis added).
[11] *Id*. § 4.
[12] *Id.* § 3 (emphasis added).
[13] *Id.* § 7 (emphasis added).

> (4) *Reasonable protection of water uses*, land values, investments and enterprises that are dependent on previously allowable withdrawals;
>
> (5) The use to be made of the water proposed to be withdrawn and *other existing*, presently permitted or projected *uses of the water source* from which the withdrawal is to be made;
>
> ***
>
> (7) Any *state water resources management* plan adopted by the commission;
>
> ***
>
> (9) *Reasonable protection of public drinking water supplies, water quality*, wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, *water-based recreation, wetland habitat, fish and wildlife*, agriculture, and flood plains; and . . .[14]

Finally, implementing regulations corroborate that MassDEP has designated uses and criteria to protect those uses consistent with treatment as WQS:

> The Commonwealth's water resources are public resources that require sustainable management practices for the well-being and safety of its citizens, *protection of the natural environment* and for economic growth. *310 CMR 36.00 is intended to establish enforceable standards, criteria* and procedures that will enable the Department to comprehensively manage withdrawals above the threshold volume throughout the Commonwealth *to ensure an appropriate balance among competing water withdrawals and uses and the preservation of the water resource*.
>
> The Department's current understanding of the impacts of water withdrawals and other human influences on the sustainability of water resources has been informed by technical studies and the MA Executive Office of Energy and Environmental Affairs (EOEEA) Sustainable Water Management Initiative (SWMI). SWMI was convened by EOEEA and *involved its environmental agencies, the Department of Environmental Protection,* the Department of Fish and Game and the Department of Conservation and Recreation, and public water suppliers, environmental organizations, scientists, policy-makers and planners. SWMI's goal was to develop an approach to sustainable management of the Commonwealth's water resources *that balances human and ecological water needs based on the best available science*. In November 2012, EOEEA and the environmental agencies issued the Final Framework Summary for the Massachusetts Sustainable Water Management Initiative, which provides *recommendations for the permitting of water withdrawals under 310 CMR 36.00, including safe yield, streamflow criteria*, and

[14] *Id.* § 7 (emphasis added).

permit tiers. These SWMI recommendations informed the 2014 amendments to 310 CMR 36.00.[15]

B. Safe Yield criterion and stream flow criteria are new WQS under applicable statutes, case law and EPA's four-part Effects Test.

1. Water quantity affects water quality.

As noted above, Section 303 of the CWA requires states to adopt WQS for state waters and submit them to EPA for approval.[16] State WQS shall:

> protect the public health or welfare, enhance the quality of water and serve the purposes of this chapter ['to restore and maintain the chemical, physical, and biological integrity of the Nation's waters,' 33 U.S.C. § 1251(a)]. Such standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes…and other purposes[.][17]

WQS consist of designated uses for a water body and water quality criteria based on those uses.[18] Designated uses include the value of a water body for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes, including value for navigation.[19] Water quality criteria may be "expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use."[20] Further, "[w]hen criteria are met, water quality will generally protect the designated use."[21] In addition, states must develop and adopt an antidegradation policy to maintain, at a minimum, "existing instream water uses and the level of water quality necessary to protect [those] uses[…]"[22] WQS apply to "*all* waters within [the state's] boundaries regardless of the sources of the pollution."[23]

Alterations to streamflow are a well-established type of "pollution" as defined by CWA. As the Supreme Court noted, "[t]he Act's definition of pollution as 'the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water' encompasses the effects of reduced water quantity."[24] And, as EPA has recognized:

> Human-induced alteration of the natural flow regime can degrade the physical, chemical, and biological properties of a water body . . . . For example, an increase

[15] 310 CMR 36.02 (emphasis added).
[16] 33 U.S.C. § 1313(a)–(c).
[17] 33 U.S.C. § 1313(c)(2)(A).
[18] 40 C.F.R. § 131.3(i).
[19] 33 U.S.C. § 1313(c)(2)(A).
[20] 40 C.F.R. § 131.3(b).
[21] *Id.*
[22] 40 C.F.R. § 131.12(a)(1).
[23] *Barnum Timber Co. v. EPA*, 633 F.3d 894, 896 (9th Cir. 2011) (quotation and citation omitted) (emphasis in original).
[24] *PUD No. 1 of Jefferson Cnty. v. Wash. Dep't of Ecology*, 511 U.S. 700, 719 (1994).

> in the duration and frequency of high flows can degrade aquatic habitat through scouring and streambank erosion. More frequent low-flow conditions can degrade water quality through elevated concentrations of toxic contaminants resulting from decreased dilution, increased temperatures, or a decrease in dissolved-oxygen concentration. Lower flows can reduce sensitive taxa diversity and abundance, alter life cycles, cause mortality in aquatic life, and promote the expansion of invasive plants and animals. . . . Hydrologic alteration (also referred to as "flow alteration" in this document) can be a primary contributor to the impairment of water bodies that are designated to support aquatic life.[25]

Massachusetts' Integrated Report of impaired water bodies reflects and recognizes this relationship between streamflow and WQS. CWA § 305(b) requires each state to develop a report about the quality of the state's surface waters and identify waters which do not support their designated use. In Massachusetts, *all* of surface water classes designate aquatic life uses and identify the relative value of the water body as "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions."[26] States must submit this report to EPA for approval.[27] Massachusetts' 2018/2020 report identified 42 water bodies for which "dewatering" was an impairment of the use, including designated use for aquatic life.[28] Massachusetts' draft 2022 Integrated Report identified dewatering as impairing 43 water bodies in the State.[29] In 2018/2020, "flow regime modification" was a listed impairment for 39 water bodies.[30] That total increased to 40 water bodies in the 2022 draft Integrated Report.[31] *See* Appendix 1 for complete comparative tables.

Table 1: Representative excerpt from comparison of 2018/2020 IR and 2022 Draft IR, water bodies with dewatering impairment, Ipswich watershed. Category 5 is defined as "Impaired or threatened for one or more uses and requiring a TMDL."

Ipswich Watershed				**Ipswich Watershed**		
	Waterbody (page in IR)	**Cat.**			**Waterbody (page in Draft IR)**	**Cat.**
	Ipswich River (177)	5			Ipswich River (178)	5
	Ipswich River (178)	5			Ipswich River (179)	5
	Lubbers Brook (178)	5			Lubbers Brook (179)	5
	Maple Meadow Brook (178)	5			Maple Meadow Brook (179)	5

[25] RACHAEL NOVAK, ET AL., EPA REPORT 822-R-16-007, FINAL EPA-USGS TECHNICAL REPORT: PROTECTING AQUATIC LIFE FROM EFFECTS OF HYDROLOGIC ALTERATION 10 (2016), *available at* https://www.epa.gov/sites/default/files/2016-12/documents/final-aquatic-life-hydrologic-alteration-report.pdf.
[26] 314 CMR § 4.01, *et seq.*
[27] 33 U.S.C. § 1315(b).
[28] MASS. DEP'T ENV'T PROT., FINAL MASSACHUSETTS INTEGRATED LIST OF WATERS FOR THE CLEAN WATER ACT 2018/2020 REPORTING CYCLE 90–212 (2021), *available at* https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download [hereinafter 2018/2020 IR].
[29] MASS. DEP'T ENV'T PROT., DRAFT MASSACHUSETTS INTEGRATED LIST OF WATERS FOR THE CLEAN WATER ACT 2022 REPORTING CYCLE 103–221 (2022), *available at* https://www.mass.gov/doc/draft-massachusetts-integrated-list-of-waters-2022-reporting-cycle/download [hereinafter 2022 Draft IR].
[30] 2018/2020 IR at 90–212.
[31] 2022 Draft IR at 103–22.

Importantly, Massachusetts' 2022 Integrated Report does not include all of the State's watersheds and thus paints an incomplete picture of, and likely underrepresents, the scale of flow impairment in the State.[32] As noted in the EPA guidance above, in addition to being a standalone impairment, flow alteration can further exacerbate many other recognized impairments, including high temperature, high toxic contaminant concentrations, and low dissolved oxygen.[33] These impairments, separately and in conjunction, degrade aquatic life uses.

The science demonstrating the link between water quantity and quality for aquatic life is clear. EPA articulated the connection between water quality and quantity in its 2022 South Carolina Opinion Letter disapproving WQS similar to Massachusetts':

> [S]cientific information on the hydrologic conditions necessary to support aquatic life has evolved considerably over the past several decades. This science has documented the detrimental impacts that alterations of flow in a waterbody can have on aquatic life, such as degrading species distribution and abundance and altering the composition and diversity of aquatic communities. For example, when flows decrease, pollutant concentrations, sedimentation, water temperature, and salinity in downstream waters can increase and dissolved oxygen levels can decrease. Nutrients, pH, and other parameters are also impacted by flow alterations. Increases in temperature due to extreme reductions of flow from withdrawals during the critical summer low flow period can cause detrimental biological impacts...[34]
>
> […]
>
> The study of how the ecology of aquatic ecosystems changes in relationship to flow (flow-ecology) has demonstrated that aquatic life depends on each of the components of a natural flow regime reflecting the natural variation of flow conditions over space and time. The study of flow-ecology seeks to create linkages and define the relationship between alterations in flow and ecological responses. This characteristic flow pattern, or natural flow regime, supports the integrity of aquatic life by maintaining habitat of sufficient size, character, diversity, and connectivity as well as providing cues for spawning, migration, and other life history stages. Restoring and maintaining a natural flow regime has also been shown to increase system resilience to climate change.
>
> Conversely, alteration of a natural flow regime can have cascading effects on the physical, chemical, and biological properties of waterbodies, which can lead to degradation of aquatic life.… Reductions in flow alter lateral and longitudinal hydrologic connectivity, resulting in the reduction of survival of migratory fish, loss of high-quality habitat, and impacts to adjacent riparian areas. … *The most*

[32] *Id.* at iv.
[33] *See* NOVAK, *supra* note 25, at 10.
[34] EPA Opinion Letter *supra* note 9, at 10.

> *severe of alterations, when stream segments are dewatered, will result in the complete extirpation of aquatic species in those waterbodies.*[35]

Further, scientific evidence indicates not only the importance of water quantity to aquatic health locally, but also its importance to downstream aquatic health:

> [s]cientific evidence has supported the importance of a waterbody's characteristic flow pattern (including magnitude, timing, duration, frequency, and rate of change), or natural flow regime, for sustaining aquatic life [and] the dependence of downstream lake, bay, and estuary health on characteristic patterns of freshwater inputs.[36]
>
> […]
>
> [D]ownstream bays and estuaries are *dependent* upon a characteristic pattern of freshwater flows from rivers and streams to support their aquatic life—affecting all levels of physical, chemical, and biological functions.… The timing and delivery of upstream freshwater flows has been identified as a major factor for bay and estuary biological productivity, such as shellfish harvesting and fisheries. Anthropogenic reductions of flow, and changes to the timing and delivery of freshwater flows, can create hypersaline conditions, change habitat, and drastically alter estuarine species composition. Lakes have also adapted to hydrologic conditions to support aquatic life. Significant alterations of input flows can impact fishing and recreational uses.[37]

Indeed, "a wealth of scientific information has documented the detrimental impacts that reduction in flow can have on the integrity of waters."[38]

Given the myriad effects that flow alteration can have on water quality, flow standards are inextricably linked with the core components of WQS—designated uses, criteria sufficient to protect them, and antidegradation policies.[39] Accordingly, the Supreme Court has long held that flow standards and WQS are inextricably linked in a legal sense. In *PUD No. 1 of Jefferson County v. Washington Department of Ecology*, the Court held that the State of Washington could impose a minimum streamflow requirement on a hydroelectric project under Section 401 of the CWA because protecting streamflow effectuated state antidegradation policy.[40] Section 401 allows states to require that federally permitted projects comply with state WQS under Section 303 of the Act.[41] Accordingly, the Court held "that the State's minimum stream flow condition is

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[35] *Id*. at 15 (emphasis added).
[36] *Id.* at 14.
[37] *Id.* at 15-16 (emphasis added).
[38] *Id.* at 10.
[39] *See PUD No. 1 of Jefferson Cnty.*, 511 U.S. at 719 ("[A] sufficient lowering of the water quantity in a body of water could destroy all of its designated uses.").
[40] *Id.* at 719.
[41] *Id.* at 707.

a proper application of the state and federal antidegradation regulations, as it ensures that an 'existing instream water us[e]' will be 'maintained and protected.'"[42]

The Court reaffirmed its position that a state's regulation of water quantity is inseparable from its regulation of water quality in *S.D. Warren Co. v. Maine Board of Environmental Protection*:

> [T]he Act does not stop at controlling the 'addition of pollutants,' but deals with 'pollution' generally, *see* § 1251(b), which Congress defined to mean 'the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water,' § 1362(19). The alteration of water quality as thus defined is a risk inherent in limiting river flow and releasing water through turbines.[43]

In *S.D. Warren Co.*, the Court again upheld a state's ability to impose minimum flow restrictions on a hydroelectric project under Section 401:[44]

> The alteration of water quality as thus defined ["water quality which provides for the protection and propagation of fish . . . and . . . for recreation." 33 U.S.C. § 1251(a)(2)] is a risk inherent in limiting river flow and releasing water through turbines, … [and] changes in the movement, flow, and circulation of a river … fall within the State's legitimate legislative business.[45]

Therefore, stream flow criteria are a type of "water quality standard."[46]

In sum, "[t]hat quality and quantity of water should not be distinguishable has been decided by the Court under the Clean Water Act."[47] Flow standards are inextricable from WQS under federal law, and contemporary science conclusively establishes the validity of that legal linkage.

2. Statute and case law establish EPA mandatory authority to review state laws that have the effect of modifying WQS

Under the CWA, EPA's mandatory review duty is triggered "[w]henever the State revises or adopts a new [water quality] standard."[48] While the CWA clearly requires EPA to review new or revised state WQS,[49] EPA regulations further require EPA to review laws and regulations "generally affecting [the] application and implementation" of WQS, including "mixing zones,

[42] *Id.* at 719 (omission in original).
[43] 547 U.S. 370, 385 (2006).
[44] *Id.* at 387.
[45] *Id.* at 385–86.
[46] *See id.* at 385–87.
[47] *Mfd. Hous. Inst. v. EPA*, 467 F.3d 391, 401 (4th Cir. 2006).
[48] 33 U.S.C. § 1313(c)(2)(A).
[49] *Id.*

low flows and variances."[50] Simply put, if "the practical effect" of a law is to revise or to add to state WQS, then EPA must review the law or policy under Section 303(c).[51]

EPA's duty to review and approve such standards does not depend on whether a state submits the law to EPA:[52]

> [A state's] failure to submit any new or revised standards cannot circumvent the purposes of the CWA. . . . Even if a state fails to submit new or revised standards, a change in state water quality standards could invoke the mandatory duty imposed on the Administrator to review new or revised standards.[53]

For example, in *Miccosukee Tribe of Indians of Florida v. EPA*, the Eleventh Circuit reversed a district court's decision which found that the Administrator had no duty under Section 303(c) to review a law that had not been submitted by the State of Florida.[54]

Similarly, EPA's duty to review and approve these laws does not depend on whether a state facially designates the policy as a WQS.[55] Rather, EPA has a duty to review any state law with "*the effect*" or "*practical impact*" of modifying state WQS, even if the state "did not consider the [law] as a change in a state water quality standards [and] made no submission to the Administrator."[56] In *FPIRG*, it was immaterial that a Florida statute expressly stated that "[i]t is not the intent of this chapter to establish new water quality criteria or standards."[57] What mattered was whether the statute had a practical effect on state WQS.[58] Otherwise, a state "could radically modify its water quality standards, simply disavow that a change had taken place, and the EPA could rely on [the state's] disavowal to avoid its mandatory review of the modified standards."[59] EPA has endorsed *FPIRG* and the "Effects Test."[60]

If a state law authorizes activities that undermine state WQS, the law consequently lowers the WQS. EPA has a mandatory duty to review such laws. This is "the only logical conclusion."[61] For example, in *Northwest Environmental Advocates v. EPA*, the court held that EPA had a mandatory duty to review a state law that "essentially exempt[ed] various nonpoint sources of [] pollution from complying with water quality standards."[62] The law did not contain

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[50] 40 C.F.R. § 131.13.
[51] *Fla. Pub. Int. Rsch. Grp. Citizen Lobby, Inc. v. EPA*, 386 F.3d 1070, 1090 (11th Cir. 2004).
[52] *Miccosukee Tribe of Indians of Fla. v. EPA*, 105 F.3d 599,602 (11th Cir. 1997).
[53] *Id.*
[54] *Id.* at 602; *accord. Kingman Park Civic Ass'n v. EPA*, 84 F. Supp. 2d 1, 6 (D.D.C. 1999) ("Where a state has made a decision that would otherwise trigger EPA review, the state may not evade such review by simply refusing to reduce its decision to a formal submission.").
[55] *FPIRG*, 386 F.3d at 1089.
[56] *Id.* at 1088–89 (emphasis added).
[57] 386 F.3d at 1075 (alteration in original).
[58] *Id.*
[59] *Id.* (citation omitted).
[60] *See* U.S. ENV'T PROT. AGENCY, EPA PUB. NO. 820F12017, WHAT IS A NEW OR REVISED WATER QUALITY STANDARD UNDER CWA 303(C)(3)? FREQUENTLY ASKED QUESTIONS 2–3 (2012).
[61] *Miccosukee Tribe of Indians of Fla. v. United States*, No. 95-0533-CIV-DAVIS, 1998 WL 1805539, at *17 (S.D. Fla. Sept. 14, 1998).
[62] 855 F. Supp. 2d 1199, 1210–11 (D. Or. 2012) (Mag. J.).

all the components of a WQS but was "intrinsically intertwined with the promulgated water quality standards" and carried "the potential to interfere with the attainment of water quality standards."[63] Considering the effects of the new law on WQS, the court reasoned:

> Just as the CWA demands that the EPA review new or revised water quality standards, it must also require a review of new or revised regulations that affect whether and how those standards are applied. The EPA cannot choose to review and approve water quality standards while ignoring separate provisions which have the potential to cripple the application of those standards. If the EPA is required to determine whether proposed water quality criteria are 'sufficient to protect the designated uses' it would undermine the purposes of the Act to not require a review of provisions promulgated that may enable or disable the attainment of that criteria. 40 C.F.R. § 131.6.[64]

In such a case, EPA's attempt to disclaim its review duty "is not based on a permissible construction of the statute."[65] If it were, "[t]he CWA would be nothing more than a paper tiger."[66]

As these cases demonstrate, for purposes of EPA's duty to review new or revised WQS, it is immaterial that states—not EPA—have direct regulatory authority over nonpoint source pollution and water allocation under the CWA.[67] That is because state WQS apply to *all* forms of pollution "regardless of the sources of the pollution."[68] When a state law, which allows nonpoint source pollution or excessive water withdrawals—itself a form of pollution— effectively modifies or creates state WQS, EPA has the authority and duty to review this "new or revised" standard for consistency with the Act.[69] If that were not the law, states could modify established WQS without EPA overview or review. Such unfettered state power to reconfigure WQS would obliterate the purpose of the Act and its careful scheme of pollution controls. In holding that state stream flow requirements are "water quality standards," the Supreme Court in *PUD No. 1 of Jefferson County* rejected the argument that states' authority over water allocation removes flow regulations from the Act's ambit, explaining that:

> Sections [1251(g)] and [1370(2)] preserve the authority of each State to allocate water quantity as between users; they do not limit the scope of water pollution controls that may be imposed on users who have obtained, pursuant to state law, a water allocation. In *California v. FERC*, 495 U.S. 490, 498 (1990), construing an analogous provision of the Federal Power Act, we explained that "minimum stream

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[63] *Id.* at 1209–10.
[64] *Id.* at 1211.
[65] *Id.*
[66] *Miccosukee Tribe of Indians*, 1998 WL 1805539 at *18 ("allow[ing] agricultural runoff to violate water quality standards" is a "new or revised water quality standard" requiring EPA review).
[67] *See* 33 U.S.C. §§ 1251(g), 1370(2).
[68] *Pronsolino v. Nastri*, 291 F.3d 1123, 1127 (9th Cir. 2002).
[69] *See e.g.*, *id.* at 1127, 1140 (holding EPA had authority under Section 303(c) to review state's total maximum daily loads for waters impaired *solely* by nonpoint source pollution); *cf. Snoqualmie Indian Tribe v. FERC*, 545 F.3d 1207, 1217–19 (9th Cir. 2008) (holding federal agency had authority to strengthen state flow requirements imposed as Section 401 conditions to protect beneficial uses of state waters).

> flow requirements neither reflect nor establish 'proprietary rights' to water." *Cf. First Iowa Hydro-Electric Cooperative v. FPC*, 328 U.S. 152, 176, and n.20 (1946). . . . Our view is reinforced by the legislative history of the 1977 amendment to the Clean Water Act adding [§ 1251(g)]. See 3 Legislative History of the Clean Water Act of 1977 (Committee Print compiled for the Committee on Environment and Public Works by the Library of Congress), Ser. No. 95–14, p. 532 (1978) ("The requirements [of the Act] may incidentally affect individual water rights. . . . It is not the purpose of this amendment to prohibit those incidental effects. It is the purpose of this amendment to ensure that State allocation systems are not subverted, and that effects on individual rights, if any, are prompted by legitimate and necessary water quality considerations.").[70]

The "argument that the EPA's disapproval of [] nonpoint source provisions would require the EPA to directly regulate nonpoint sources is not persuasive."[71] EPA's task under Section 303(c) is not to regulate any source of pollution but to review state WQS for consistency with the Act. If such standards are deemed inadequate, the state has 90 days to correct deficiencies.[72] Only if the state fails to timely bring its standards into compliance with the Act must EPA promulgate a lawful standard,[73] and even then, the enforcement of nonpoint source provisions is left to the state.

In sum, the CWA and case law establish five relevant principles. First, EPA has the authority and duty to review state laws that have the effect of modifying state WQS or creating new ones. Second, EPA has that authority and duty whether or not a state formally submits its regulations to EPA for review. Third, that authority and duty to review is not obviated simply because the state law addresses water withdrawals, or other nonpoint sources of pollution, that EPA does not directly regulate under the CWA. Fourth, EPA authority is not limited to those state laws characterized as WQS. Fifth, and finally, EPA review of state stream flow or water withdrawal rules is permissible, even if review "may incidentally affect individual water rights" so long as such effects "are prompted by legitimate and necessary water quality considerations."[74]

3. EPA guidance: Effects Test to determine new or revised WQS

EPA has further developed the "practical effect" framework of *FPIRG*, devising a four-part "Effects Test" for determining whether a provision constitutes a new or revised WQS that EPA has the authority and duty to review and approve or disapprove.[75] If the responses to the following four questions are "yes," EPA had a mandatory duty to review the relevant provisions:

> 1. Is it a legally binding provision adopted or established pursuant to state or tribal law?

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[70] *PUD No. 1 of Jefferson Cnty.*, 511 U.S. at 720–21 (citations formatted).
[71] *Nw. Env't Advoc.*, 855 F. Supp. 2d at 1212–13.
[72] 33 U.S.C. § 1313(c)(3).
[73] *Id.* § 1313(c)(3)–(4).
[74] *See PUD No. 1 of Jefferson Cnty.*, 511 U.S. at 721 (citations omitted).
[75] U.S. ENV'T PROT. AGENCY, 820-B-14-008, WATER QUALITY STANDARDS HANDBOOK, Ch. 1.5.1, at 4–6.

2. Does the provision address designated uses, water quality criteria (narrative or numeric) to protect designated uses, and/or antidegradation requirements for waters of the United States?
3. Does the provision express or establish the desired condition (e.g., designated uses, criteria) or instream level of protection (e.g., antidegradation requirements) for waters of the United States immediately or mandate how it will be expressed or established for such waters in the future?
4. Does the provision establish a new WQS or revise an existing WQS?[76]

EPA interprets "[q]uestion one [a]s a threshold question of legal applicability."[77] Without a legally binding provision, there is no need to undergo the remainder of the Effects Test.

Questions two and three are the central questions in the Effects Test analysis. "Question two reflects CWA articulation that WQS include three core components: designated uses, water quality criteria, and antidegradation requirements."[78] If the second question of the Effects Test addresses whether a WQS is at play in a provision, "[q]uestion three addresses the substance of the provision and whether it changes one or more of the components of a WQS, such that the provision expresses or establishes a different water quality goal for CWA purposes."[79]

If the first three questions are answered affirmatively, the fourth, which "clarifies that the EPA's authority, as specified in CWA section 303(c)(2)(A), is to act only on new or revised WQS provisions, which includes provisions that have not previously been approved by EPA under section 303(c)," is raised.[80]

If all four questions are answered affirmatively, EPA has the authority and duty to approve or disapprove the new or revised WQS under CWA section 303(c)(3).

III. Massachusetts' Safe Yield and stream flow criteria are new or revised WQS under the Effects Test, requiring non-discretionary EPA review.

Addressing question one, the WMA and its implementing regulations are undisputedly legally binding, as the WMA was passed into state law in 1985.[81] Following a process called the Sustainable Water Management Initiative (SWMI), MassDEP promulgated regulations to enact the goals articulated by WMA in 2012.[82] As such, provisions for both Safe Yield and streamflow satisfy the first factor of the Effects Test.

Turning to questions two and three of the four-part Effects Test, several provisions in the WMA and implementing regulations pertain to water quality criteria and express desired

[76] *Id.* at 5–6.
[77] EPA Opinion Letter *supra* note 9, at 4.
[78] *Id.* citing CWA §§ 303(c)(2)(A), 303(d)(4)(B).
[79] *Id.* at 4.
[80] *Id*.
[81] *See* MASS. GEN. LAWS ch. 21G, § 1 *et seq.*; 310 CMR 36.01–36.44.
[82] MASS. SUSTAINABLE WATER MGMT. INITIATIVE (SWMI), FRAMEWORK SUMMARY 4 (2012), *available at* https://www.mass.gov/doc/framework-november-2012/download.

condition of all Massachusetts water bodies in terms of Safe Yield and stream flow criteria. These include, but are not limited to:

> Safe Yield Provision One in WMA:
> "Safe Yield," the maximum dependable withdrawals that can be made continuously from a water source including ground or surface water during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided, however, that such dependability is relative and is a function of storage and drought probability.[83]
>
> Safe Yield Provision Two in WMA:
> The department shall, by regulation, specify, for each water source from which withdrawals are to be permitted, a date upon which its regulations *establishing criteria, standards and procedures for issuing permits* shall become effective. No person may, after the effective date thus specified, make a new withdrawal of more than the threshold volume of water from any water source, or construct any building or structure which may require that person to make such a new withdrawal of water unless such person obtains a permit in accordance with regulations adopted by the department.
>
> *In adopting regulations establishing criteria and standards for obtaining permits*, the department shall assure, at a minimum, that the following factors are considered:—
>
> > […]
> >
> > (9) *Reasonable protection of public drinking water supplies, water quality*, wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, *water-based recreation, wetland habitat, fish and wildlife*, agriculture, and flood plains[.][84]
>
> Safe Yield Provision in Implementing Regulations:
> 36.13: Safe Yield
> (1) Safe yield of a water source[85] is calculated as 55% of the drought basin yield plus the reservoir storage volume, if any, for that water source. For the purposes of calculating safe yield:
> > (a) drought basin yield is the annualized Q_{90} streamflows in a water source based on averaging estimated near natural monthly Q_{90} streamflows. It is an estimation of the water that would be available in an unimpacted river basin during the probable driest period that is likely to occur; and
> > (b) reservoir storage volume is the modeled volume of water remaining in reservoir storage at the end of a simulated one-year drought comprised of

[83] MASS. GEN. LAWS ch. 21G § 3; 310 CMR 36.03.
[84] MASS. GEN. LAWS ch. 21G § 7 (emphasis added).
[85] *See* 310 CMR 36.03 ("Water Source means any natural or artificial aquifer or body of surface water, including its watershed where ground and surface water are interconnected in a single hydrological system. For the purposes of 310 CMR 36.00, water sources are the river basins delineated by the Commission at 313 CMR 4.03: Delineation of River Basins.")

annualized monthly Q_{90} flows, calculated as available storage minus any registered or permitted withdrawals and any required release volume; and
(c) reservoir storage volume is capped at the firm yield of the reservoir.

(2) Should registered volumes for a water source, taking into account any determinations made by the Department pursuant to 310 CMR 36.27(4), exceed safe yield, no additional volumes of water will be available through permitting. Where such registered volumes do not exceed safe yield there is no presumption that withdrawals will be permitted. The allocation of water available for permitting within the safe yield will be determined, and may be limited by, application of streamflow criteria, statutory and regulatory requirements, and site-specific considerations pursuant to M.G.L. c. 21G and 310 CMR 36.00.

(3) Safe yield, reservoir storage volume(s), total registered volumes and currently permitted volumes for each water source will be published on the Department's website.

(4) In a water source where reservoir storage volume is a factor in determining safe yield, reservoir storage volumes are available only to those permittees with legal access to the reservoir(s).

(5) For water sources where an estimate of near natural annualized Q_{90} streamflow is not applicable because the water source is groundwater-driven (the southern portion of South Coastal, Cape Cod, Islands, and portions of Buzzards Bay), safe yield is determined through analysis of water available during the probable driest period through groundwater recharge for each water source.[86]

The WMA's Safe Yield provisions consider impacts on water quality, including criteria and designated uses. Under the WMA, MassDEP must establish "criteria, standards and procedures" for issuing withdrawal permits.[87] Safe Yield, one criteria the WMA outlined and which MassDEP established through SWMI regulations, is defined in terms of "maximum dependable withdrawal" [88] and calculated in terms of percent of drought basin yield.[89] As such, Safe Yields are expressed as levels, one way in which WQS can be expressed under the CWA, which contemplates WQS to be "expressed as constituent concentrations, *levels*, or narrative statements, representing a quality of water that supports a particular use."[90]

Further, the WMA expressly requires MassDEP to consider a number of factors in developing these criteria, including "reasonable protection of water uses" and "reasonable protection of public drinking water supplies, water quality, wastewater treatment capacity, waste assimilation capacity,[91] groundwater recharge areas, navigation, hydropower resources, water-

[86] 310 CMR 36.13.
[87] MASS. GEN. LAWS ch. 21G § 7.
[88] *Id.* at § 3; 310 CMR 36.03.
[89] 310 CMR 36.13.
[90] 40 C.F.R. § 131.3(b) (emphasis added).
[91] It should be noted that EPA regulations expressly prohibit states from considering waste assimilation as a designated use. 40 C.F.R. § 131.10(a).

based recreation, wetland habitat, fish and wildlife, agriculture, and flood plains."[92] This language closely tracks the language of CWA § 303(c)(2)(A), which requires that WQS consider a water body's "use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes," including "value for navigation."[93] As such, these criteria "take into account downstream users and designated uses . . . in a manner that is indistinguishable from how states must set WQS for waterbodies under CWA section 303(c)(2)(A)."[94] Further, the WMA's criteria considerations reflect Massachusetts' *actual* designated uses, including uses for public water supplies, aquatic life, recreation, and agriculture.[95] Thus, Safe Yield is a WQS; specifically, Safe Yield is a WQS because it has been explicitly developed as a criteria to protect designated uses. As such, Safe Yield satisfies the second factor of the Effects Test.

Turning to factor three of the Effects Test, through Safe Yield, the WMA establishes a desired condition for Massachusetts waters. The WMA developed provisions that express or establish the desired conditions for waters of the United States immediately and mandate how it will be expressed or established for such waters in the future through Safe Yield criteria developed to protect designated uses. Specifically, WMA's Safe Yield provisions are nearly identical to the South Carolina provisions that EPA determined were WQS. Both provisions establish new hydrologic criteria. The WMA's implementing regulations define Safe Yield as "55% of the drought basin yield plus the reservoir storage volume, if any, for that water source."[96] Drought basin yield is further defined as "the annualized Q_{90} streamflows in a water source based on averaging estimated near natural monthly Q_{90} streamflows."[97] Like the EPA-disapproved South Carolina provisions, the Massachusetts Safe Yield provisions establish the amount of water that can be withdrawn while protecting designated uses, thus establishing desired conditions for State waters, now and for the future. As such, the Safe Yield provisions satisfy the third Effects Test prong.

Finally, in addition to new hydrologic criteria, the Safe Yield regulation sets new biologic criteria as well. The CWA puts a special emphasis on protecting aquatic life in the Nation's waters. Achieving "water quality which provides for the protection and propagation of fish, shellfish, and wildlife" is one of the Act's first enumerated goals.[98] In line with this goal, Section 303(c)(2)(A) specifically contemplates "the propagation of fish and wildlife" as a class of designated uses that states must consider in establishing WQS.[99] In other words, "there is a rebuttable presumption that water quality standards should be protective of the fishable/swimmable use the statute seeks to achieve."[100]

The Supreme Court has recognized the importance of aquatic habitat in the Act's WQS scheme. In *PUD No. 1 of Jefferson County*, the Court upheld Washington's ability to deny a

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[92] MASS. GEN. LAWS ch. 21G § 7.
[93] 33 U.S.C. § 1313(c)(2)(A).
[94] EPA Opinion Letter, *supra* note 9, at 7.
[95] *See* 314 CMR 4.05.
[96] 310 CMR 36.13(1).
[97] *Id.* § 36.13(1)(a).
[98] 33 U.S.C. § 1251(a)(2).
[99] 33 U.S.C. § 1313(c)(2)(A).
[100] *Kans. Nat. Res. Council, Inc. v. Whitman*, 255 F. Supp. 2d 1208, 1209 (D. Kans. 2003).

hydropower permit because it would interfere with "'[s]almonid [and other fish] migration, rearing, spawning, and harvesting.' The designated use of the river as a fish habitat directly reflects the Clean Water Act's goal of maintaining the 'chemical, physical, and biological integrity of the Nation's waters.'"[101]

Likewise, aquatic life uses are an integral part of Massachusetts' EPA-approved WQS.[102] Indeed, all of Massachusetts' surface water classes designate aquatic life uses, which identify each class's relative value as "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions."[103] Massachusetts' water quality criteria reflect the importance of these uses by establishing parameters for dissolved oxygen, temperature, pH, nutrients, and toxic pollutants.[104] However, Massachusetts' EPA-approved WQS do not include hydrologic criteria to protect aquatic life nor biological criteria to protect aquatic life, both of which are recommended by EPA. By setting hydrologic criteria in the WMA Safe Yield provision and establishing new biologic criteria for fluvial fish community characteristics alteration through the stream flow criteria,[105] the WMA and its implementing regulations constitute a new desired condition. Therefore, the WMA stream flow criteria satisfy the third prong of the Effects Test.

Stream Flow Criteria Provisions in Implementing Regulations

> (1) Streamflow criteria are established by the categories described at 310 CMR 36.14(1)(a) through (c), which describe the modeled 2000-2004 existing conditions at the subbasin scale across a gradient of alteration from least to most altered for five bioperiods: early summer (May- June), late summer (July through September), fall (October and November), winter (December through February) and spring (March and April). The streamflow criterion for each category is the upper limit of the ranges shown at 310 CMR 36.14(1)(a) through (c). Withdrawals that contribute to a subbasin changing to a more altered category do not meet streamflow criteria and will only be permitted if the permittee demonstrates that there is no feasible alternative available to meet demonstrated water needs, and the permittee undertakes mitigation commensurate with the impacts of the withdrawal to the greatest extent feasible.
>
> > (a) Biological Category for each subbasin is based on the simulated 2000-2004 existing condition of aquatic habitat using fluvial fish community characteristics as the surrogate indicator variable. Each biological category represents the percent alteration within the range of these fluvial fish community characteristics as a function of the following subbasin parameters:
> >
> > 1. impervious cover;

[101] 511 U.S. at 714 (citation omitted).
[102] 314 CMR 4.01, *et seq.*
[103] *Id.* § 4.05.
[104] *Id.*
[105] MASS. GEN. LAWS ch. 21G § 11; 310 CMR 36.19, 36.22, 36.14.

2. cumulative groundwater withdrawal as a portion of the unimpacted August median flow;
3. stream channel slope; and
4. percent wetland within the stream buffer area.

Simulated Alteration of Fluvial Fish Community Characteristics.

Biological Category 1: 0% to 5%
Biological Category 2: >5% to 15%
Biological Category 3: >15% to 35%
Biological Category 4: >35% to 65%
Biological Category 5: >65%

(b) Groundwater Withdrawal Category for each subbasin is based on the ratio of the 2000–2004 groundwater withdrawal volume to the unimpacted median monthly flow for August and represents conditions during the late summer bioperiod (July through September). Each groundwater withdrawal category represents the range of this ratio that would result in the biological category of the same number under conditions of low (1%) impervious cover.

Simulated Groundwater Withdrawal Ratio for the Late Summer Bioperiod.

Groundwater Withdrawal Category 1: 0% to 3%
Groundwater Withdrawal Category 2: >3% to 10%
Groundwater Withdrawal Category 3: >10% to 25%
Groundwater Withdrawal Category 4: >25% to 55%
Groundwater Withdrawal Category 5: >55%

(c) Seasonal Groundwater Withdrawal Categories for each subbasin are based on the ratio of the 2000-2004 groundwater withdrawal volume to the unimpacted median monthly flow for the four other bioperiods below.

	Fall (Oct-Nov)	Winter (Dec-Feb)	Spring (March-April)	Early Summer (May-June)
Seasonal Category 1:	0% to 3%	0% to 3%	0% to 3%	0% to 3%
Seasonal Category 2:	>3% to 5%	0% to 3%	0% to 3%	>3% to 3%
Seasonal Category 3:	>5% to 15%	>3% to 10%	>3% to 10%	>3% to 15%
Seasonal Category 4:	feasible mitigation and improvement/ no numeric criteria			
Seasonal Category 5:	feasible mitigation and improvement/ no numeric criteria			

"Water quality criteria represent the conditions (e.g., concentrations of particular chemicals, levels of certain parameters, or narrative statements) sufficient to restore and maintain the chemical, physical, and biological integrity of water bodies, and protect applicable

designated uses."[106] The streamflow provisions for categories 1–3 adequately establish biological conditions necessary to protect designated uses of Massachusetts' water bodies. However, although categories 4 and 5 purport to establish such protective conditions, they fail to do so.

The above "streamflow criteria" provision establishes a tiered scheme of "biological categories" based on the scientifically-based "simulated 2000-2004 existing condition of aquatic habitat using fluvial fish community characteristics as the surrogate indicator variable."[107] The provision places these categories along a "gradient of alteration from least to most altered" for five time periods over the course of a year.[108] Withdrawals from a water body that cause it to drop in category are not permitted unless a permittee demonstrates that there is no feasible alternative and implements mitigation measures.[109] This provision codifies a biological condition gradient, a categorization that EPA has endorsed for "decid[ing] what environmental conditions are desired."[110] Thus, the streamflow criteria provision establishes new biological criteria—the condition of aquatic habitat in a water body, measured against a baseline condition, that corresponds to a given biological category. As such, this provision alone contains two core components of WQS: water quality criteria and antidegradation policy. It thereby affirmatively answers the second question of EPA's four-part test: the provision does "address water quality criteria to protect designated uses."[111] Once established, the biological category for the water body may not be lowered, thereby affirmatively answering the third question of EPA's four-part test: the provision does "establish a desired condition" for water bodies.[112]

If a provision satisfies the first three factors and has not been previously approved by EPA under Section 303(c), then it meets the fourth factor and constitutes a new or revised WQS, which EPA has a mandatory duty to approve or disapprove under the CWA.[113] In this case, EPA has not reviewed the Safe Yield and the streamflow criteria provisions in the WMA and its implementing regulations. The Safe Yield and streamflow criteria provisions satisfy all four parts of the Effects Test. As such, EPA has a non-discretionary duty to review these provisions for consistency with the requirements of the CWA.

IV. EPA should disapprove Massachusetts' new or revised WQS.

EPA has a nondiscretionary duty under CWA § 303(c) to review new or revised WQS for consistency with the Act's requirements and approve or disapprove those standards. EPA review is based, in part, on whether water quality criteria are "based on sound scientific rationale,"[114] whether water quality criteria "protect designated use[s],"[115] and whether the State "t[ook] into consideration the water quality standards of downstream waters and […] ensure[d] that its water

[106] EPA Opinion Letter, *supra* note 9, at 5.
[107] 310 CMR 36.14(1)(a).
[108] *Id.* § 36.14(1).
[109] *Id.*
[110] U.S. ENV'T PROT. AGENCY, EPA PUB. NO. 810-R-11-01, A PRIMER ON USING BIOLOGICAL ASSESSMENTS TO SUPPORT WATER QUALITY MANAGEMENT 16 (2011).
[111] EPA Opinion Letter, *supra* note 9, at 6.
[112] *Id.*
[113] *Id.* at 9.
[114] 40 C.F.R. § 131.5(a)(2).
[115] 40 C.F.R. § 131.11(a).

quality standards provide for the attainment and maintenance of the water quality standards of downstream waters."[116] Here, Massachusetts' new or revised WQS fail to meet EPA's requirements for consistency with the CWA and EPA should therefore disapprove them.

The WMA tasked MassDEP and the Water Resources Commission with establishing "a balance among competing water withdrawals and uses" and "protect[ing] the natural environment of the water in the commonwealth."[117] Following the SWMI process discussed above, MassDEP promulgated regulations to enact the WMA's articulated goals. SWMI's stated goal was to "ensure prudent and sustainable use of water, maintain healthy watersheds and gradually improve degraded ones."[118] However, the resulting regulations failed to establish a regulatory scheme that meets these goals because the WMA and its implementing SWMI regulations fail to incorporate vital seasonal and location factors in Safe Yield calculations. Instead, the implementing regulations rely on annual averages to calculate Safe Yields.[119] These averages incorporate peak spring flows, inflating Safe Yield above actual flow during summer low flow periods. Accordingly, the SWMI regulations are not based on sound science.

Additionally, as discussed in section II.B above, scientific evidence and understanding proves the link between reduction in flow and detrimental impacts on designated uses. In Massachusetts, *all* surface water classes designate aquatic life uses and identify the relative value of the water body as "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions."[120] As such, science documenting known harms to aquatic flora and fauna occasioned by reduced flow bears on the analysis. Indeed, in South Carolina, while recognizing that scientific evidence does not "dictate" the outcome of EPA's review, the "wealth of scientific information has documented the detrimental impacts that reduction in flow can have on the integrity of waters, and this science [] informed the Agency's analysis" in that circumstance, as it should here.[121]

The collective consequences of the WMA's new WQS have been dire in rivers across the state such as the Parker River, which is dangerously overburdened by withdrawals from municipal sources, and the Ipswich River, which, due to excessive withdrawals, was named by American Rivers one of this country's most endangered rivers in 2021.[122] The WMA and its implementing regulations have resulted in the dewatering and flow regime modification of water bodies throughout the state, a result that does not protect designated uses and one that climate change increasingly exacerbates.[123] This failure to protect designated uses is a direct result of the unscientific methodologies underpinning the WMA and SWMI regulations. For these reasons, EPA must disapprove the offending WMA provisions and its implementing regulations as inconsistent with the CWA.

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[116] 40 C.F.R. § 131.10(b).
[117] MASS. GEN. LAWS ch. 21G § 3.
[118] MASS. SUSTAINABLE WATER MGMT. INITIATIVE (SWMI), FRAMEWORK SUMMARY 4 (2012).
[119] 310 CMR 36.13.
[120] 314 CMR 4.01, *et seq.*
[121] EPA Opinion Letter *supra* note 9, at 10.
[122] American Rivers, 2021 Most Endangered Rivers List Highlights Need For Environmental Justice (last visited June 29, 2023), https://www.americanrivers.org/2021/04/2021-most-endangered-rivers-list-highlights-need-for-environmental-justice/.
[123] *See* Appendix 1, Tables 1.1 and 1.2.

A. Safe Yield requirements are not based on sound science and do not protect designated uses.

Safe Yield "is the primary mechanism the WMA uses to achieve its balance between withdrawers and ecological needs," defined as:

> [T]he maximum dependable withdrawals that can be made continuously from a water source including ground or surface water during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur; provided, however, that such dependability is relative and is a function of storage and drought probability.[124]

MassDEP further elaborates on this definition in the WMA's regulations:

> [T]he modeled volume of water remaining in reservoir storage at the end of a simulated one-year drought comprised of annualized monthly Q_{90} flows, calculated as available storage minus any registered or permitted withdrawals and any required release volume.[125]

The WMA and SWMI regulations set Safe Yield hydrologic criteria that do not protect designated uses of Massachusetts' waters. These hydrologic criteria are scientifically unsound, a flaw that should lead to disapproval because "[t]he effectiveness of narrative flow criteria depends, in part, on the establishment of scientifically defensible methods to quantitatively translate and implement the narrative."[126] Safe Yield is a fundamental concept in hydrology and can be a useful criteria when measuring withdrawals, but proper criteria relies, at a minimum, on two fundamental factors: season and location. MassDEP's Safe Yield criteria removes each of these fundamental factors by averaging withdrawals over the entire year and on the scale of major river basins when sub-basin data produced by MassDEP is readily available.[127] The major river basin scale measurements create a standard that would allow withdrawals upstream of the point of Safe Yield calculation that can be orders of magnitude larger than the Q_{90} flows at the point of withdrawal. Accordingly, DEP's criteria produce "Safe Yield" values that overburden waterbodies, particularly during natural low flow and high usage seasons. As such, Massachusetts' Safe Yield criteria is not scientifically sound to protect designated uses.

Additionally, a third factor—accurate accounting of all withdrawals—exacerbates the overburdening created by this already scientifically unsound safe yield methodology. Without accurately accounting for all water withdrawals within a basin, including below-threshold withdrawals, it is impossible to adequately calculate Safe Yield under the present methodology.

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[124] 310 CMR 36.03.
[125] 310 CMR 36.13.
[126] See NOVAK, *supra* note 25, at 49.
[127] *See id.*

For example, Safe Yield for the Parker River basin is 15.0 million GPD, more than six times existing withdrawals, despite the basin already being incredibly over withdrawn.[128] In 2001, the Massachusetts Water Resources Commission designated the Parker River as one of the most flow-depleted basins in the state.[129] As a USGS-designed perennial river, the Parker—like the Ipswich—by definition does not go dry even during severe droughts. Nonetheless, the Parker River's flow has hit 0 CFS as recently as August 2022.[130] Subbasin 21056, located within the Parker River basin, is among the most severely impacted subbasins in the State:[131] *See* Images 1–3, the Parker and Ipswich Rivers running dry:

Image 1: Parker River, Georgetown, 2022 near town wellfield

[128] MASSDEP BUREAU OF WATER RESOURCES SAFE YIELD AND ITS COMPONENTS BY MAJOR BASIN (MARCH 29, 2016), *available* at https://www.mass.gov/doc/summary-of-safe-yield-values-for-the-27-major-river-basins-in-massachusetts/download (last visited July 12, 2023).
[129] MASS. WATER RES. COMM'N, STRESSED BASINS IN MASSACHUSETTS 20 (Dec. 13, 2001), *available at* https://www.mass.gov/doc/stressed-basins-in-massachusetts-report-0/download.
[130] *Parker River at Byfield, MA*, U.S. GEOLOGICAL SURV., https://waterdata.usgs.gov/monitoring-location/01101000/#parameterCode=00060&period=P365D (last visited June 29, 2023).
[131] Subbasin 21056 is at the most severe Biological and Ground Water Categories, BC 5 and GWC 5. *See Groundwater Withdrawal Category (GWC) August 2013 data*, MASS. DEP'T ENV'T PROT. (April 2014), *available at* https://www.mass.gov/doc/gwc-calculator-april-2014/download; *Biological Category (BC), BC variables and Regression Equation Solver, v. 4.0*, MASS. DEP'T ENV'T PROT. (April 2014), *available at* https://www.mass.gov/doc/regression-equation-solver-april-204/download.

Image 2: Mill St. Bridge, mainstem of Ipswich River[132]

Image 3: Winthrop St. Bridge, mainstem of Ipswich River[133]

See also, Appendix 2, containing stills depicting rivers in the Parker and Ipswich watersheds running low or dry from (1) a recent short film, "When in Drought, Massachusetts," which illustrates the link between withdrawals, drought, and climate change, [134] and (2) IRWA members.

With more than half of the watershed protected as the Parker River National Wildlife Refuge, the Parker River basin offers myriad recreational activities and is a major ecological resource for the region. Additionally, like all water body classifications in the State, the Parker is designated to protect aquatic life. Each of these uses is at risk due to excessive withdrawals, and the degradation will only get worse as the effects of climate change escalate.[135] The average annual temperature in the Parker River Basin is projected to rise by 3.7 to 10.9ºF by the end of the century.[136] In that time, the number of days with temperatures over 90ºF is expected to increase from 1 to up to 67 days compared to the 1971-2000 baseline period.[137] The threat of high stress events brought on by climate change and the reduced system resilience caused by reduced flow make it all the more important that Parker River's Safe Yield calculation reflects actual water availability, not inflated annual averages.

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[132] Photograph of Mill St. Bridge, Reading, Mass. (Ipswich Watershed), Aug. 28, 2022 (photograph provided by IRWA).
[133] Photograph of Winthrop St. Bridge, Ipswich, Mass. (Ipswich Watershed), July 26, 2022 (photograph provided by IRWA).
[134] WHEN IN DROUGHT, MASSACHUSETTS (Turnaround Films), *available at* https://www.turnaround-films.com/20-public-drought-in-ma.
[135] *See* EPA Opinion Letter, *supra* note 9, at 15 (elucidating climatologic link between flow and climate resilience).
[136] Mass. Exec. Off. Energy Env't Aff., Environmental Notification Form Certificate for G. Mello Disposal Corp. Proposed Solid Waste Handling and Processing Facility (June 12, 2020) at 11, *available at* https://www.georgetownma.gov/sites/g/files/vyhlif616/f/news/1_-_attach_3_mepa_resubmission_06-16-2021_0.pdf.
[137] *Id.*

1. Annualized averages ignore seasonal variations in flow.

Flow requirements that support biological integrity must be sensitive to seasonal variations in river systems, characterized by fluctuations in water quantity and conditions over time. Prolonging the duration or frequency of low flow events or reducing the magnitude of high spring "flushing" flows can have cascading effects throughout an ecosystem. The Regulated Riparian Model Water Code recognizes this need for variation, "to mimic[] the natural cycle of spring floods and summer low flows in order to sustain the biological integrity of the stream."[138] Annualized average streamflow models lack this sensitivity to mimic natural variations and flow regimes; thus annualized averages are not a scientifically sound tool for regulating water withdrawals and do not protect designated uses, failing to meet criteria defined in 40 CFR section 131.5 and 131.11.

EPA took this position when it disapproved South Carolina's Safe Yield provisions, which were based on a percentage of mean annual daily flow:

> Because the mean annual daily flow is a statistical value not correlated to how much water is actually in the waterbody at any given time, this could result in a calculated safe yield that is greater than the amount of water in a river or stream at certain times of the year. In those instances where a withdrawer is only subject to the safe yield provision and not required to meet minimum instream flow, there are no minimum amounts of water required to be left instream. Therefore, withdrawing the entire safe yield could allow removal of all the water in a waterbody during some times of the year, which would not maintain and support aquatic life.[139]

Though its parameters are different, the WMA's Safe Yield regulation uses the same basic methodology as the South Carolina law—an annualized mean of streamflow. Having established that the WMA satisfies the Effects Test and triggers non-discretionary review, this methodology should be disapproved as employing faulty methodology in establishing water quality criteria.

The WMA and its implementing regulations use an annual mean—in this case, 55% of Q_{90} plus reservoir storage volume[140]—to calculate Safe Yield. This methodology is faulty for multiple reasons. First, large peak flows in spring inflate Safe Yield, resulting in an unsustainably high figure in natural low-flow months. Second, high demand for water withdrawals during the summer months coincides with these low flow periods, further compounding the problem of overallocation. As Figures 1 and 2 below show, Safe Yield can vastly exceed the available water in a basin's major river more than half of the year. Both the Parker and Ipswich Rivers are listed as impaired due to dewatering.[141]

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[138] AM. SOC'Y CIV. ENG'RS, REGULATED RIPARIAN MODEL WATER CODE § 1R-1-11: Preservation of Minimum Flows and Levels 9 (2004).; *see also,* NOVAK, *supra* note 25, at 10.
[139] EPA Opinion Letter, *supra* note 9, at 12.
[140] 310 CMR 36.13.
[141] *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle*, MASS. DEP'T ENV'T PROT. 112, 177-78 (November 2021), https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download; *See also* Appendix 1*,* Table 1.1.

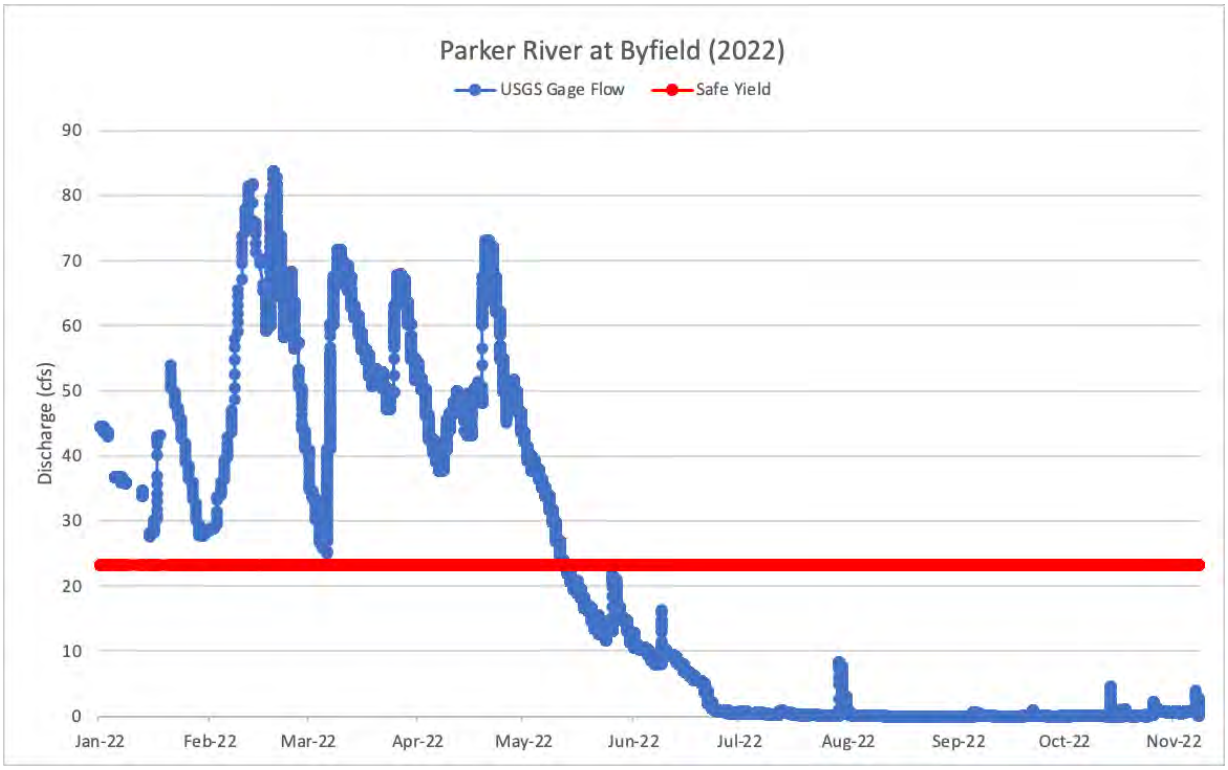

Figure 1. Streamflow for the Parker River at Byfield (USGS Gage 01101000) depicted in blue. Safe Yield for the Parker River Basin shown in red. Time period from January 2022 to November 2022. Source: Mass Rivers Alliance.

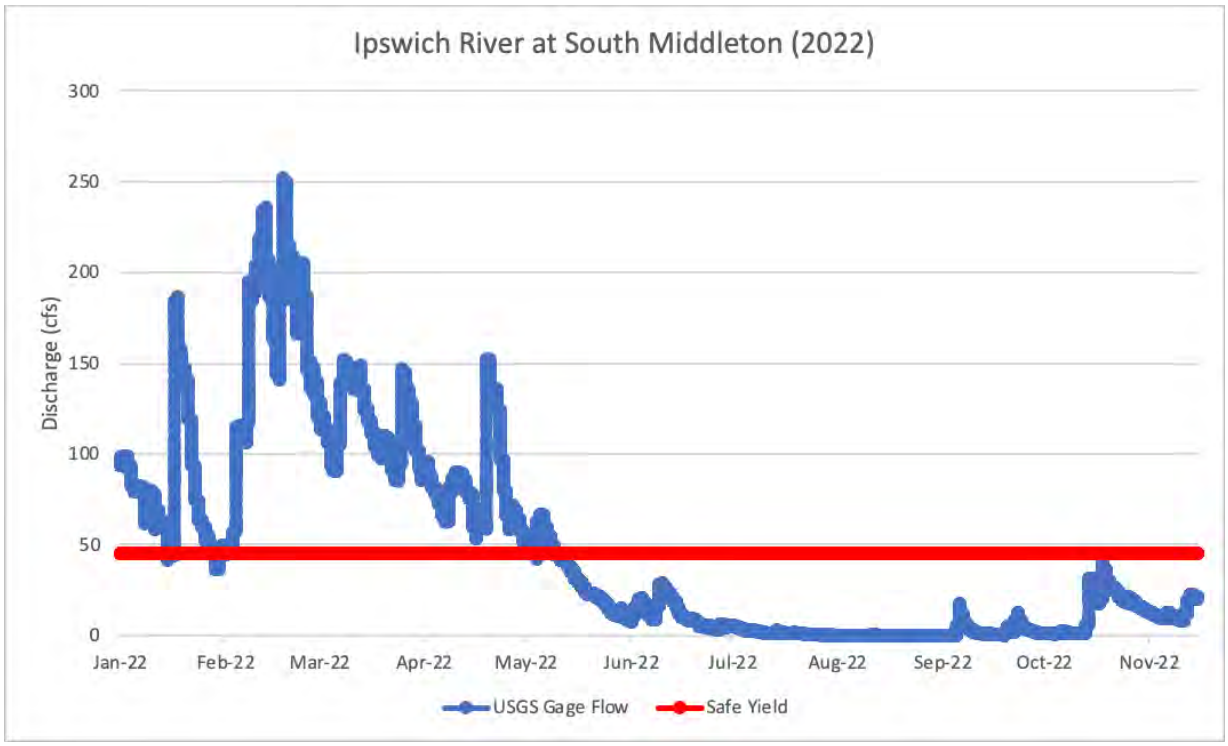

Figure 2. Streamflow for Ipswich River at South Middleton (USGS Gage 01101500) depicted in blue. Safe Yield for the Ipswich River Basin shown in red. Time period from January 2022 to November 2022. Source: Mass Rivers Alliance.

2. Basin-wide Safe Yield calculations allow the overallocation of subbasin water bodies.

Location is also a critical variable for determining how much water is available for withdrawal in a water body. Just as seasonal flow variations can undermine the accuracy of Safe Yield calculations, using an overly broad geographic scale can result in equally inaccurate measurements of available water. [142] The WMA's focus on basin-wide data for Safe Yield calculations allows for concentrated subbasin withdrawals limited only by the larger basin's Safe Yield. This methodology is scientifically unsound.[143] As Figures 3 and 4 below show, Safe Yield can greatly exceed the available water in small subbasins. If the basin has not yet reached Safe Yield, then the full volume of discharge in smaller rivers is available for permitted withdrawal for most of the year.

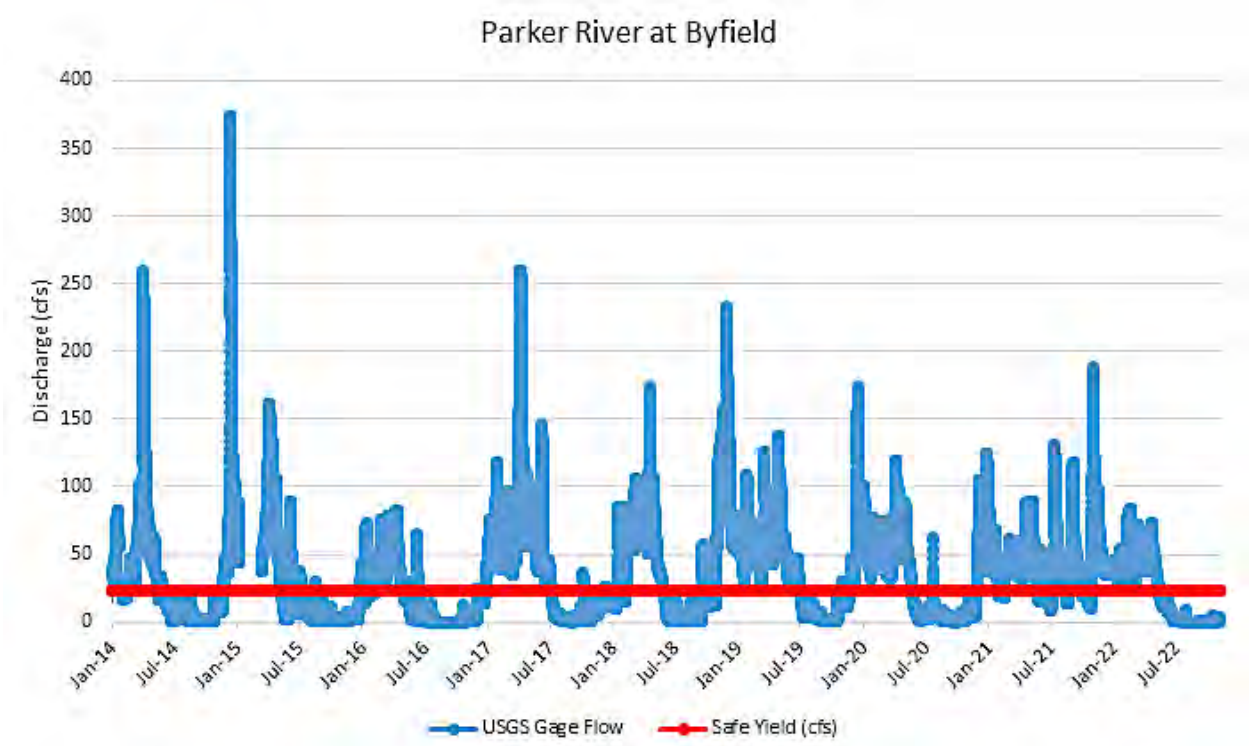

Figure 4. Streamflow for the Parker River at Byfield (USGS Gage 01101000) depicted in blue. Safe Yield for the Parker River Basin shown in red. Time period extends from January 2014 to November 2022. Source: Mass Rivers Alliance.

[142] For example, the Parker River basin contains 16 subbasins and, while the basin as a whole is strained, the impact between subbasins GWC categorizations range from the best (1) to the worst (5). *Groundwater Withdrawal Category (GWC) August 2013 data*, MASS. DEP'T OF ENV'T PROT. (April 2014), *available at* https://www.mass.gov/doc/gwc-calculator-april-2014/download.

[143] This problem is exacerbated in the Parker River, where one third of the watershed's square footage is either salt water or brackish marsh. The basin-wide Safe Yield calculation does not account for a large percentage of non-potable or otherwise unusable salt water. Moreover, disproportionate withdrawal of freshwater in these estuarial rivers can draw salt water farther into the river body, which can have severe environmental effects.

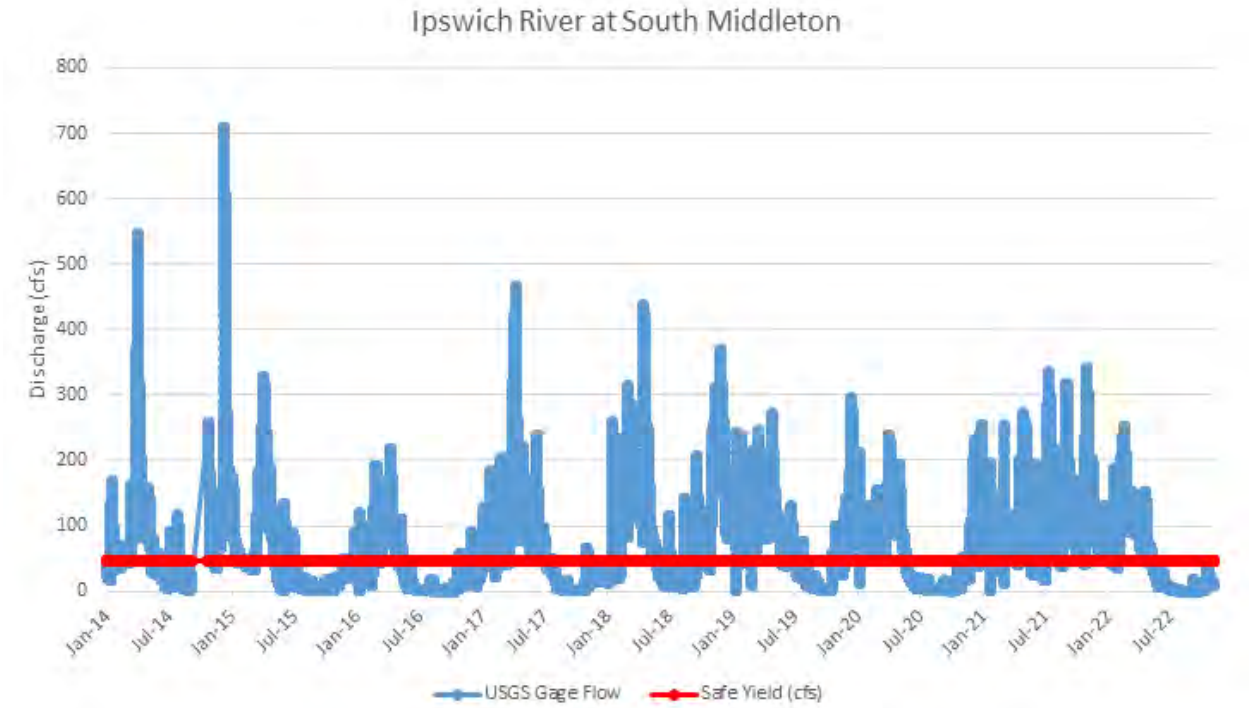

Figure 5. Streamflow for Ipswich River at South Middleton (USGS Gage 01101500) depicted in blue. Safe Yield for the Ipswich River Basin shown in red. Time period from January 2014 to November 2022. Source: Mass Rivers Alliance.

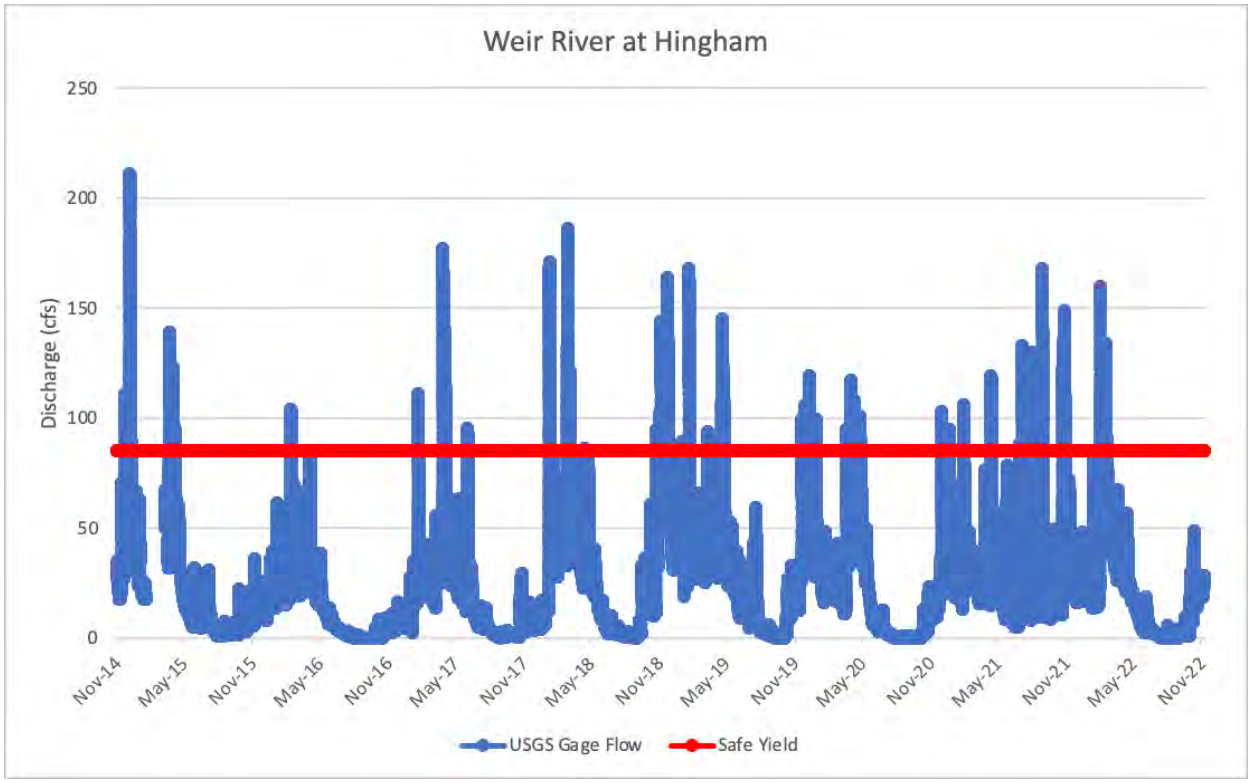

Figure 6. Streamflow for the Weir River at Hingham (USGS Gage 01105638) depicted in blue. Safe Yield is for the Boston Harbor Basin which includes the Weir River watershed, shown in red. Time period extends from January 2014 through November 2022. Source: Mass Rivers Alliance.

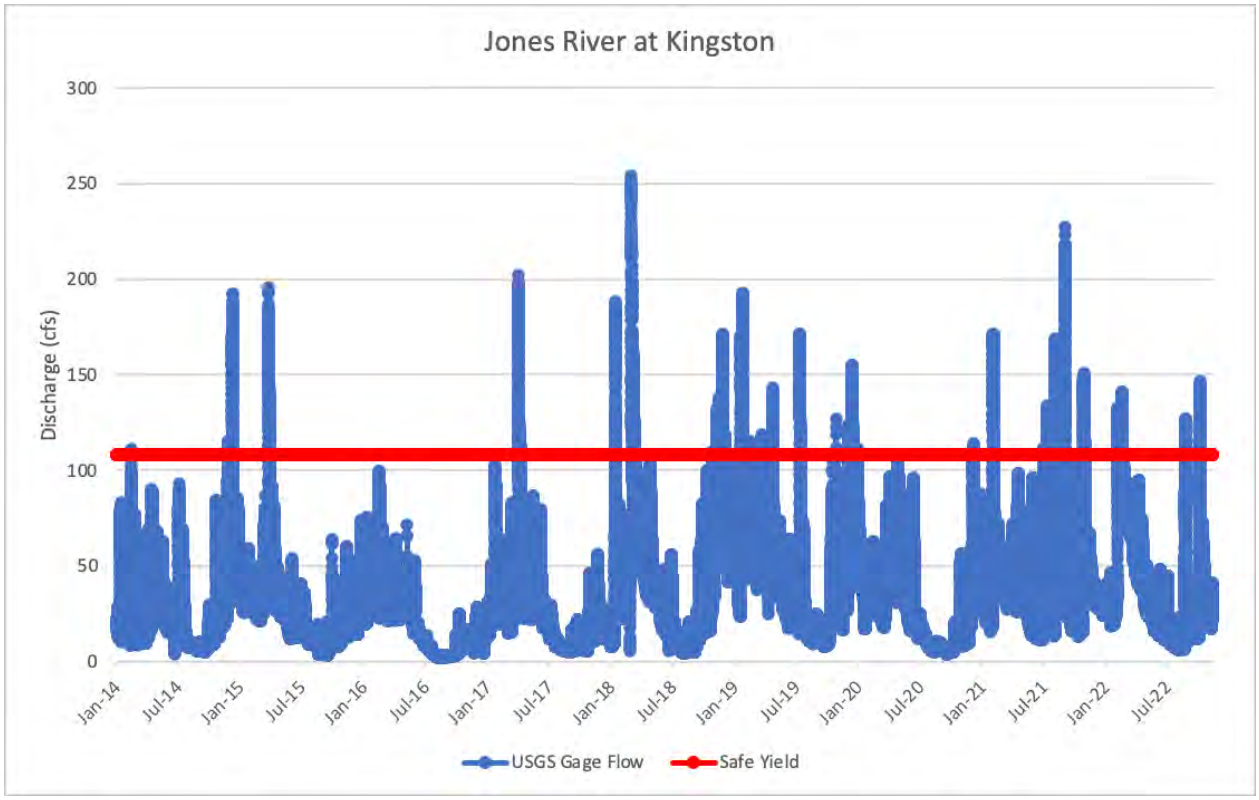

Figure 7. Streamflow for the Jones River at Kingston (USGS Gage 01105870) depicted in blue. Safe Yield is for the South Coastal Basin which includes the Jones River watershed, shown in red. Time period extends from January 2014 through November 2022. Source: Mass Rivers Alliance.

In sum, MassDEP's reliance on basin-wide data inaccurately distorts and undermines Safe Yield criteria and is scientifically unsound. Moreover, these unsound methodologies fail to protect designated uses including aquatic life uses and the relative value of the water body as "habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions."[144] The 2018/2020 and draft 2022 Integrated Reports confirm the failure to protect these designated uses.[145] EPA should disapprove this provision as inconsistent with the CWA and its implementing regulations as inconsistent with the requirements of 40 CFR 131.5 and 131.11.

3. Safe Yield does not account for under threshold withdrawals, which are increasing and which undermine application of safe yield standards.

The current threshold for permits and registrations, 100,000 GPD, is exceedingly high and allows for a significant aggregation of unregulated withdrawers resulting in reduced actual flow. A MassDEP study of below-threshold withdrawals in the Parker River basin identified a

[144] 314 CMR 4.05.
[145] *See* Appendix 1, Tables 1.1 and 1.2.

significant number of withdrawals in the 20–100K GPD range.[146] MassDEP estimates put the volume of below-threshold withdrawals around 2.3 million GPD in the Ipswich River watershed alone (with a high estimate of 3.2 million GPD), while independent researchers estimate the number is roughly double that.[147] These below-threshold withdrawers continue, without regulation to strain the flow of their subbasins. Meanwhile, none of these withdrawals are balanced in the Safe Yield analysis for permits, creating the illusion that basins have more water available before violating Safe Yield. As noted above, "[t]he EPA cannot choose to review and approve water quality standards while ignoring separate provisions which have the potential to cripple the application of those standards."[148] The WMA's separate below-threshold provision results in an inaccurate accounting of the water available in watersheds for withdrawal. This inherent inaccuracy is crippling; without an accurate picture of the water withdrawn, it is impossible to calculate accurate Safe Yield or stream flow criteria.

Additionally, MassDEP has the nondiscretionary duty, as indicated in the WMA, to review the threshold level of 100,000 GPD every five years and adjust it "upon a finding that such different threshold is necessary and adequate to protect the public health, safety and welfare."[149] However, MassDEP has failed to review the 100,000 GPD threshold since the WMA was enacted in 1986. If it chooses not to reduce the threshold for all withdrawals, MassDEP could still target stressed subbasins with specialized standards. For example, MassDEP could reduce the threshold volume in those subbasins to 20,000 GPD, maintaining comfortable space for single family home use.[150] Regardless, the current, unreviewed threshold level of 100,000 GPD is not based on sound science, and therefore should be disapproved by EPA. Likewise, MassDEP's policy of not including below threshold withdrawals in the Safe Yield calculation for that basin is not supported by science, undermines the Safe Yield criteria, and creates a false impression of how much water is being withdrawn at any given time. EPA should disapprove this policy as well.

B. Streamflow criteria are not based on sound scientific rationale and do not protect designated uses

For registered, above-threshold withdrawers seeking to withdraw beyond their registered amount, the WMA's permitting scheme contains a putative failsafe in addition to Safe Yield: its "streamflow criteria" provision. The provision states:

> Withdrawals that contribute to a subbasin *changing to a more altered category* do not meet streamflow criteria and will only be permitted if the permittee demonstrates that there is no feasible alternative available to meet demonstrated

[146] *See* Exhibit B, MASSDEP, Inventory of Below WMA Threshold Water Withdrawal Sources in the Ipswich and Parker River Watersheds (Oct. 12, 2018) ("MassDEP Below WMA Threshold Inventory"). Exhibit B contains excerpts of the full report, which is not available on-line but can be provided upon request.
[147] *See* Exhibit C, at 5 (IRWA Critique of the MassDEP Below WMA Threshold Inventory) (August 7, 2019).
[148] *See Nw. Env't Advoc., supra* note 62, at 1211.
[149] *See* MASS. GEN. LAWS ch. 21G § 4.
[150] *See* U.S. ENV'T PROT. AGENCY, *How We Use Water* (May 24, 2022), https://www.epa.gov/watersense/how-we-use-water#Daily%20Life (noting that "the average American family uses more than 300 gallons of water per day at home").

> water needs, and the permittee undertakes mitigation commensurate with the impacts of the withdrawal to the greatest extent feasible.[151]

While this provision clearly provides a loophole via its "feasibility" clause, it is largely nullified given that many subbasins are already at the most altered biological category (BC5), as noted in Figure 5 below.[152] Subbasins colored red cannot "[change] to a more altered [biological] category."[153] Thus, existing withdrawals in these most depleted subbasins can avoid triggering mitigation requirements because by definition these basins cannot change to a more altered biological category.

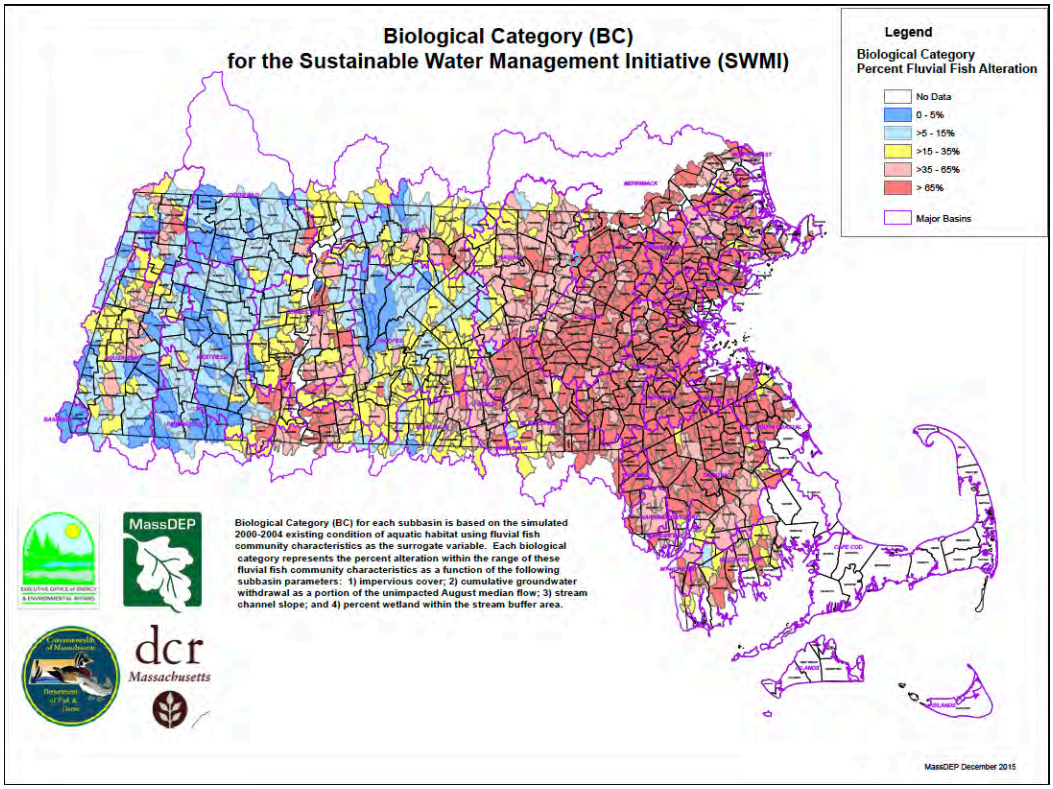

Figure 8. This map shows the biological categories for Massachusetts subbasins in December 2015. Subbasins in red have reached the most altered category, thus precluding additional mitigation requirements for withdrawers. Source: MassDEP.

Even more problematic is the fact that the highest two levels of habitat alteration in the WMAs streamflow criteria regulation likely violate the CWA's interim goal of protecting aquatic life by their own terms. The WMA's biological condition gradient is based on a six-tier model of habitat alteration.[154] While EPA has recognized a consensus in the scientific community that "levels 1, 2, 3 and either some or all of BCG level 4 characteristics" are "generally compatible"

[151] 310 CMR 36.14(1) (emphasis added).
[152] *See* MASS. DEP'T ENV'T PROT., *Biological Category Statewide Map* (December 2015), *available at* https://www.mass.gov/doc/biological-category-statewide-map/download.
[153] 310 C.M.R. 36.14(1).
[154] *See* Susan P. Davies & Susan K. Jackson, *The Biological Condition Gradient: A Descriptive Model for Interpreting Change in Aquatic Ecosystems*, 16 ECOLOGICAL APPLICATIONS 1251 (2006) (describing six tiers).

with the CWA's goal for the protection of aquatic life, it has also recognized "unanimous" agreement that levels 5 and 6 are incompatible with CWA goals.[155]

In this case, part of the state's level 4 category and all of level 5 roughly align with the incompatible levels of alteration recognized by EPA. Thus, the streamflow criteria expressly permit the degradation of state waters beyond what is permissible under the Act. Moreover, they will often allow such degradation with minimal mitigation requirements, given that much of the state is already in the most altered category. So, while the biological gradient categorization system is based on sound science, and biological criteria categories 1–3 appear consistent with the CWA, biological categories 4 and 5 set standards that do not protect designated uses making them inconsistent with the CWA. The 303(d) list of impaired waterways reinforces that biological categories 4 and 5 set non-protective standards.[156]

In sum, EPA should find levels 4 and 5 of the WMA's streamflow criteria inconsistent with the CWA because they are not based on sound scientific rationale, and they do not protect designated uses and therefore fail to meet the requirements of 40 CFR 131.11.

C. Massachusetts' new or revised WQS do not protect downstream waters.

Both federal regulation and EPA guidance documents require consideration of downstream uses in setting designated use and criteria for water bodies. This required consideration is plain in the language of 40 CFR 131.10(b):

> [i]n designating uses of a water body and the appropriate criteria for those uses, the State *shall take into consideration the water quality standards of downstream waters* and *shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters*.[157]

The relevant regulations therefore lay out a holistic vision of watershed health that requires consideration of downstream impacts of upstream uses.

EPA guidance, *Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions*, corroborates this required downstream use consideration. EPA advocates a watershed approach to WQS. As such, it is "useful to consider…uses and criteria for the downstream receiving waters" and to "consider other water bodies that may flow to downstream waters and may affect hydrologic flow and/or pollutant concentrations in these

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[155] ENV'T PROT. AGENCY, EPA PUB. NO. 842-R-16-001, A PRACTITIONER'S GUIDE TO THE BIOLOGICAL CONDITION GRADIENT: A FRAMEWORK TO DESCRIBE INCREMENTAL CHANGE IN AQUATIC ECOSYSTEMS 28 (2016), *available at* https://www.epa.gov/sites/default/files/2016-02/documents/bcg-practioners-guide-report.pdf.

[156] MassDEP further undermined its streamflow criteria by creating a new "baseline" standard that is not supported by the WMA or the CWA. In its regulations, MassDEP defines baseline as "the volume of water withdrawn during calendar year 2005 plus 5%, or the average annual volume withdrawn from 2003 through 2005 plus 5%, or the registered volume, whichever is greater," with certain exceptions. 310 CMR 36.03. The artificial baseline concept creates an exemption for "new withdrawals" from some of the WMA's permitting requirements that does not exist in the plain language of the Act, is not supported by sound science and is not protective of designated uses.

[157] 40 C.F.R § 131.10(b) (emphasis added).

locations."[158] Additionally, "[w]here an upstream use is shown to be unattainable due to physical conditions," like the limited flow, "attainable use may be established instead, but numeric or narrative criteria should also be established that provide for the attainment and maintenance of the (potentially more stringent) water quality standards assigned to downstream waters."[159]

Moreover,

> if water quality in downstream waters is trending over time towards a level of pollutants (or hydrologic flows) that may lead to exceedance of [an] applicable pollutant criteria in the future, this information can be used to preemptively identify pollutant sources (or sources of changes in hydrologic flows) and determine if one or more upstream criteria needs to be made more stringent to prevent impairment of downstream water body(ies).[160]

Finally, the scope of downstream considerations is not only temporally but also geographically broad: "[d]ownstream impacts of upstream uses and criteria should be considered as far downstream as adverse impacts are observed or expected to occur from upstream pollution (including hydrologic flow alteration[])."[161]

Taken together, these suggest that WQS must consider a waterway's holistic health— at present and in the future—and cannot allow upstream use to frustrate or degrade downstream use even if protecting those downstream uses requires "more stringent" restrictions on upstream use then might otherwise be required.

The WMA's withdrawal provisions themselves specifically require consideration of downstream uses. Section 7, for instance, requires minimum consideration of "the impact of the proposed withdrawal on other water sources which are hydrologically interconnected," "reasonable protection of water uses," and "reasonable protection of public drinking water supplies, water quality, wastewater treatment capacity, waste assimilation capacity, groundwater recharge areas, navigation, hydropower resources, *water-based recreation, wetland habitat, fish and wildlife,* agriculture, and flood plains." [162] Despite required consideration of downstream uses, including those that require flow, there is no indication that the criteria will "provide for the attainment and maintenance of the water quality standards of downstream waters."[163] Hydrologic flow alteration, in the form of reduced flows resulting from distorted and inaccurate safe yield and streamflow criteria that do not consider impacts on downstream waters, can result in adverse downstream impacts. Indeed,

> downstream bays and estuaries are dependent upon a characteristic pattern of freshwater flows from rivers and streams to support their aquatic life—affecting all

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[158] ENV'T PROT. AGENCY, EPA PUB. NO. 820-F-14-001, PROTECTION OF DOWNSTREAM WATERS IN WATER QUALITY STANDARDS: FREQUENTLY ASKED QUESTIONS 3 (June 2014), *available at* https://www.epa.gov/sites/default/files/2018-10/documents/protection-downstream-wqs-faqs.pdf
[159] *Id.* at 5.
[160] *Id.* at 12.
[161] *Id.* at 5.
[162] MASS. GEN. LAWS ch. 21G § 7 (emphasis added).
[163] 40 C.F.R. § 131.10(b).

> levels of physical, chemical, and biological functions. … Anthropogenic reductions of flow, and changes to the timing and delivery of freshwater flows, can create hypersaline conditions, change habitat, and drastically alter estuarine species composition.[164]

Together, this is sufficient reason to disapprove of these WQS because there is no basis to conclude that MassDEP considered WQS for downstream waters or that criteria would provide for maintenance and protection of the WQS of downstream waters per the mandates of 40 CFR 131.10(b).

V. Conclusion

As the Supreme Court has long recognized, a "sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation or [as] a fishery."[165] Water flow is often called a "master variable" for aquatic life protection, as it affects all three components of water quality defined by the CWA—the chemical, physical, and biological integrity of the Nation's waters.[166] Accordingly, state statutes, regulations and policies governing water quantity and instream flow affect water quality, including attainment of designated uses. Under CWA § 303, EPA must review such state provisions for consistency with the CWA. In the case of Massachusetts, the WMA and its implementing regulations effect a nearly identical change in state WQS as the South Carolina provisions that EPA found triggered its mandatory review obligations.

It is of no significance that Massachusetts has not specifically labeled the WMA and its implementing regulations as "water quality standards" or failed to submit them for EPA review.[167] Nor does it matter that these provisions touch on a form of nonpoint source pollution—water withdrawals—that EPA does not directly regulate under the CWA.[168] Under the Act, "no activity is allowable . . . which could partially or completely eliminate any existing use[.]"[169] EPA-reviewed state WQS apply to *all* forms of pollution "regardless of the sources of the pollution."[170] Because the WMA Safe Yield and streamflow provisions satisfy the EPA's four-part test for new or revised WQS, they must be reviewed along with all provisions for the WMA and its implementing regulations. While Safe Yield and streamflow meet the four-part test, there may be other WQS in the WMA and implementing regulations that also satisfy the test and it is EPA's duty to identify and review them. IRWA, PRCWA, and Mass Rivers reserve the right to add additional laws and regulations that qualify as WQS into any future lawsuit based on the analysis outlined here.

Having triggered mandatory review under CWA §303, the WQS established in the WMA and its implementing provisions must be disapproved because the standards are not scientific, are

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[164] *See* EPA Opinion Letter, *supra* note 9, at 13.
[165] *PUD No.1 of Jefferson Cnty.*, 511 U.S. at 719.
[166] *See* NOVAK, *supra* note 25, at 8.
[167] *E.g.*, *FPIRG*, 386 F.3d at 1088–91.
[168] *See, e.g.*, *PUD No. 1 of Jefferson Cnty.*, 511 U.S. at 720–21; *Nat. Res. Def. Council v. McCarthy*, 231 F. Supp. 3d 491, 498–502 (N.D. Cal. 2017); *Nw. Env't Advoc.*, 855 F. Supp. 2d at 1212–13.
[169] *PUD No. 1 of Jefferson Cnty.*, 511 U.S. at 718 (citation and quotations omitted).
[170] *Barnum Timber Co.*, 633 F.3d at 896 (quotation and citation omitted)

not protective of designated use, and do not account for downstream uses. The WQS are not scientifically sound because, despite purportedly considering the "[r]easonable protection of . . . water quality,"[171] the WMA and its implementing regulations objectively fail to do so. For example, the WMA bases water allocations on statistical mean flows,[172] which "do[] not reflect the variability in flow levels that occurs during the year."[173] Moreover, the WMA allows withdrawals up to "Safe Yield" without accounting for below threshold withdrawers, each of which can withdraw up to 100,000 gallons per day,[174] a class of withdrawal that can make up a significant portion of overall withdrawals and is growing rapidly in the Ipswich and Parker Basins. Additionally, streamflow criteria include a biological condition gradient that includes two categories (4 and 5) that are per se incompatible with CWA goals and an arbitrary baseline concept that creates an exemption from some of the WMA's permitting requirements for new withdrawals that do not exist in the plain language of the Act. Both streamflow criteria and the arbitrary baseline exempt withdrawers from mitigation requirements.[175] These laws and regulations not only lack a sound scientific rationale, but they also fail to protect the State's designated uses because they do not adequately protect the State's waters from further impairment. Finally, the WMA and accompanying regulations also fail to consider downstream uses, including for water-based recreation, wetland habitat, and fish and wildlife. As such, they are inconsistent with the CWA and its implementing regulations. EPA should disapprove these laws under its CWA § 303(c) authority.

In sum, EPA has a non-discretionary duty under Section 303(c)(2)–(3) of the CWA to review the WMA and its implementing regulations for consistency with the CWA and approve or disapprove them. EPA's failure to discharge its duty violates the Act. If EPA does not initiate such review within 60 days of the postmark date of this letter, IRWA, PRCWA, and Mass Rivers will file suit to compel it to do so pursuant to 33 U.S.C. § 1365(a)(2). If during the 60-day notice period, EPA wishes to discuss any aspect of this notice, please contact Kevin Cassidy, counsel for IRWA, PRCWA, and Mass Rivers.

Respectfully Submitted,

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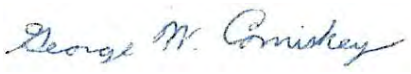
Wayne Castonguay, Executive Director
Ipswich River Watershed Alliance

[171] MASS. GEN. LAWS ch.21G § 7(9).
[172] 310 CMR 36.13, 36.14.
[173] *See* EPA Opinion Letter, *supra* note 9, at 10.
[174] MASS. GEN. LAWS ch. 21G § 5; 310 CMR 36.04, 36.13.
[175] 310 CMR 36.14, 36.03, 36.22.



George Comiskey, Vice President
Parker River Clean Water Association

Julia Blatt, Executive Director
Massachusetts Rivers Alliance

CC: Honorable Merrick Garland, United States Attorney General
Bonnie Heiple, Commissioner, MassDEP

Appendix 1

Table 1.1: Comparison 2018/2020 IR and 2022 Draft IR, water bodies with dewatering impairment (changes between 2018/2020 IR and 2022 Draft IR indicated with highlighting):[176]

2018/2020	**DEWATERING**			**2022 DRAFT**	**DEWATERING**	
Watershed	Waterbody (page in IR)	Cat.[177]		Watershed	Waterbody (page in Draft IR)	Cat.
Blackstone				Blackstone		
	Howe Reservoirs (103)	4c			Howe Reservoirs (108)	4c
	Sibley Reservoir (103)	4c			Sibley Reservoir (108)	4c
	Kettle Brook (121)	5			Kettle Brook (124)	5
	Poor Farm Brook (122)	5			Poor Farm Brook (126)	5
	Unnamed Tributary (124)	5			Unnamed Tributary (127)	5
Boston Harbor: Neponset				Boston Harbor: Neponset		
	Mill Brook (132)	5			Mill Brook (134)	5
	Plantingfield Brook (134)	5			Plantingfield Brook (136)	5
	Unquity Brook (135)	5			Unquity Brook (137)	5
Boston Harbor: Weymouth & Weir				Boston Harbor: Weymouth & Weir		
	Accord Brook (135)	5			Accord Brook (137)	5
	Weir River (137)	5			Weir River (139)	5
Charles				Charles		
	Bogastow Brook (90)	4a			Bogastow Brook (95)	4a
	Charles River (90)	4a			Charles River (95)	4a
	Kingsbury Pond (105)	4c			Kingsbury Pond (110)	4c
	Unnamed Tributary (106)	4c			Unnamed Tributary (111)	4c
Concord (SuAsCo)				Concord (SuAsCo)		
	Assabet River (159)	5			Assabet River (161)	5
	Nashoba Brook (165)	5			Nashoba Brook (166)	5
Connecticut				Connecticut		
	Connecticut River (168)	5			Connecticut River (169)	5
Deerfield				Deerfield		
	Johnson Brook (107)	4c			Johnson Brook (113)	4c
Housatonic				Housatonic		
	Karner Brook (108)	4c			Karner Brook (113)	4c

[176] 2018/2020 IR at 90–212; 2022 Draft IR at 103–221.

[177] Categories are defined in both 2018/2020 IR and 2022 Draft IR as follows:

1) Unimpaired and not threatened for all designated uses;
2) Unimpaired for some uses and not assessed for others;
3) Insufficient information to make assessments for any uses;
4) Impaired or threatened for one or more uses, but not requiring the calculation of a Total Maximum Daily Load (TMDL); or
5) Impaired or threatened for one or more uses and requiring a TMDL.

2018/2020 IR at v; 2022 Draft IR at iv.

	Long Pond Brook (108)	4c			Long Pond Brook (113)	4c
	Windsor Brook (109)	4c			Windsor Brook (114)	4c
Hudson: Hoosic				Hudson: Hoosic		
	Paull Brook (109)	4c			Paull Brook (114)	4c
Ipswich				Ipswich		
	Ipswich River (177)	5			Ipswich River (178)	5
	Ipswich River (178)	5			Ipswich River (179)	5
	Lubbers Brook (178)	5			Lubbers Brook (179)	5
	Maple Meadow Brook (178)	5			Maple Meadow Brook (179)	5
Merrimack				Merrimack		
	Merrimack River (183)	5			Merrimack River (183)	5
	Stony Brook (185)	5			Stony Brook (185)	5
Narragansett Bay (Shore)				Narragansett Bay (Shore)		
	Shad Factory Pond (189)	5			Shad Factory Pond (190)	5
Nashua				Nashua		
	Quinapoxet River (193)	5			Quinapoxet River (194)	5
North Coastal				North Coastal		
	Goldthwait Brook (196)	5			Goldthwait Brook (196)	5
	Saugus River (198)	5			Saugus River (198)	5
Parker				Parker		
	Parker River (112)	4c			Parker River (117)	4c
Quinebaug				Quinebaug		
	Cady Brook (200)	5			Cady Brook (199)	5
	Cady Brook (200)	5			Cady Brook (199)	5
Shawsheen				Shawsheen		
	Unnamed Tributary (203)	5			**Spring Brook (202)**	**5**
					Unnamed Tributary (202)	5
South Coastal				South Coastal		
	Jones River (205)	5			Jones River (204)	5
	Jones River (205)	5			Jones River (205)	5
Taunton				Taunton		
	Segreganset River (116)	4c			Segreganset River (120)	4c
	Segreganset River (116)	4c			Segreganset River (209)	5
Ten Mile				Ten Mile		
	Coles Brook (211)	5			Coles Brook (212)	5
	Scotts Brook (212)	5			Scotts Brook (213)	5

Table 1.2: Comparison 2018/2020 IR and 2022 Draft IR, water bodies with flow regime modification impairment (changes between 2018/2020 IR and 2022 Draft IR indicated with highlighting)[178]

2018/2020	**Flow Regime Modification**			**2022 DRAFT**	**Flow Regime Modification**	
Watershed	Waterbody	Cat.		Watershed	Waterbody	Cat.
Blackstone				Blackstone		
	Blackstone River (118–19)	5			Blackstone River (122)	5
	Blackstone River (119)	5			Blackstone River (122–23)	5
	Blackstone River (119)	5			Blackstone River (123)	5
	Blackstone River (120)	5			Blackstone River (123)	5
	Tatnuck Brook (123)	5			Tatnuck Brook (126)	5
Boston Harbor: Neponset				Boston Harbor: Neponset		
	East Branch (131)	5			East Branch (134)	5
	Mother Brook (132)	5			Mother Brook (134)	5
Boston Harbor: Weymouth & Weir				Boston Harbor: Weymouth & Weir		
	Town Brook (137)	5			Town Brook (138)	5
Cape Cod				Cape Cod		
	Herring River (145–46)	5			Herring River (148)	5
	Herring River (146)	5			Herring River (148)	5
Charles				Charles		
	Charles River (90)	4a			Charles River (95)	4a
	Unnamed Tributary (106)	4c			Unnamed Tributary (111)	4c
	Beaver Brook (150)	5			Beaver Brook (152)	5
	Charles River (150–51)	5			Charles River (153)	5
	Charles River (151)	5			Charles River (153)	5
	Charles River (151–52)	5			Charles River (153–54)	5
	Charles River (152)	5			Charles River (154)	5
	Charles River (152–53)	5			Charles River (154)	5
	Muddy River (154)	5			Muddy River (156)	5
Chicopee				Chicopee		
	Old Reservoir (106)	4c			Old Reservoir (111)	4c
Concord (SuAsCo)				Concord (SuAsCo)		
	Unnamed Tributary (107)	4c			Unnamed Tributary (112)	4c
Connecticut				Connecticut		
	Connecticut River (168)	5			Connecticut River (169)	5
	Connecticut River (168)	5			Connecticut River (169)	5
	Connecticut River (168)	5			Connecticut River (169)	5
Deerfield				Deerfield		

[178] 2018/2020 IR at 90–212; 2022 Draft IR at 103–221.

	Deerfield River (107)	4c			Deerfield River (112)	4c
French				French		
	French River (173)	5			French River (174)	5
Hudson: Hoosic				Hudson: Hoosic		
	Hoosic River (109)	4c			Tophet Brook (114)	4c
	Tophet Brook (109)	4c			Hoosic River (177)	5
	Hoosic River (176)	5			**Hoosic River (177)**	**5**
	Hoosic River (176)	5			Hoosic River (177)	5
	North Branch Hoosic River (177)	5			North Branch Hoosic River (177)	5
Ipswich				Ipswich		
					Unnamed Tributary (179)	**5**
North Coastal				North Coastal		
	Saugus River (198)	5			Saugus River (198)	5
	Saugus River (198)	5			Saugus River (198)	5
	Unnamed Tributary (198)	5			Unnamed Tributary (198)	5
South Coastal				South Coastal		
	Reservoir (113)	4c			Reservoir (118)	4c
	Green Harbor River (205)	5			Green Harbor River (204)	5
	Musquashcut Pond (206)	5			Musquashcut Pond (205)	5
	Silver Lake (206)	5			Silver Lake (206)	5
Taunton				Taunton		
	Unnamed Tributary (211)	5			Unnamed Tributary (211)	5

Appendix 2: Images of Depleted Waterways in Ipswich and Parker Watersheds

Image 2.1: Stranded Fish, Ipswich River:[179]

Image 2.2: Parker River, Georgetown, Mass., Aug. 2022:[180]

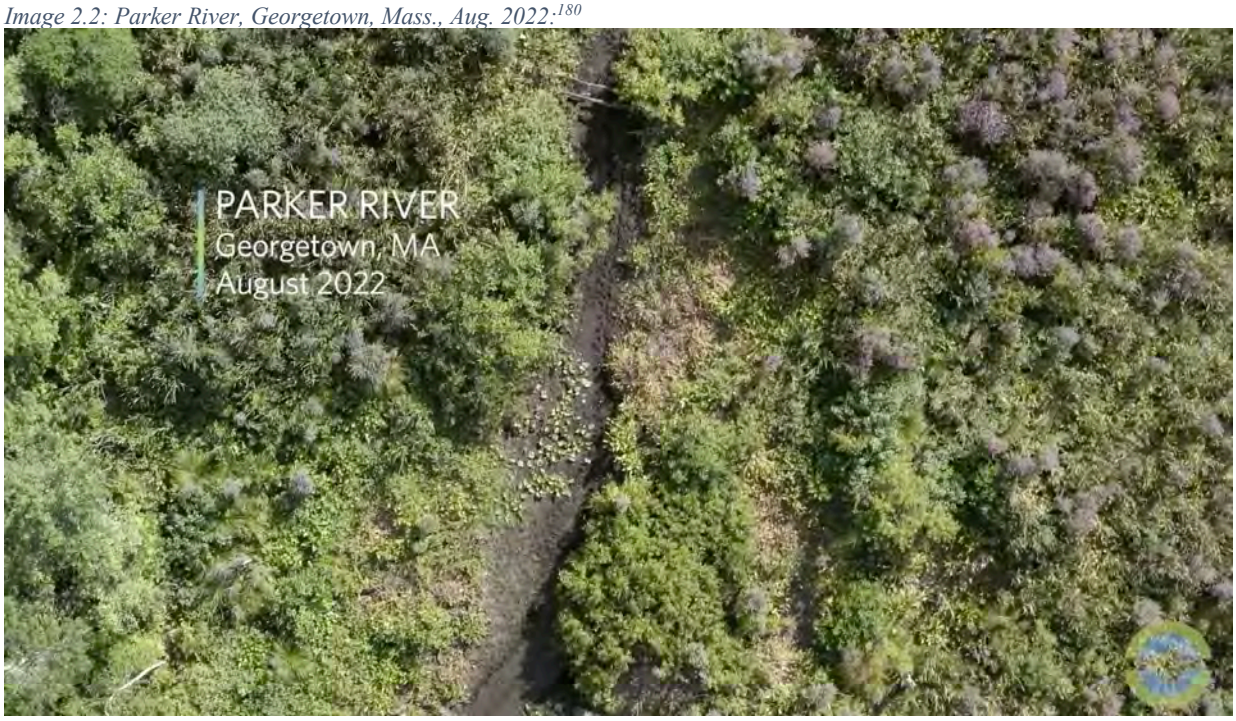


Image 2.3: Parker River, Georgetown, Mass., Aug. 2022:[181]

Image 2.4: Wheeler Brook (Parker Watershed):[182]

[179] WHEN IN DROUGHT, MASSACHUSETTS (Turnaround Films), https://www.turnaround-films.com/20-public-drought-in-ma (still at 5:00).
[180] *Id*. (still at 5:09).
[181] *Id*. (still at 5:13).
[182] *Id*. (still at 5:26).

Image 2.5: Martins Brook:[183]

Image 2.6: Willowdale Dam, mainstem of Ipswich River:[184]

[183] Photograph of Martins Brook, North Reading, Mass. (Ipswich Watershed), July 31, 2022 (photograph provided by IRWA).
[184] Photograph of Willowdale Dam, Ipswich, Mass. (Ipswich Watershed), August 28, 2022 (photograph provided by IRWA).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW
ATLANTA, GEORGIA 30303-3104

May 20, 2022

SENT VIA EMAIL

Alan Wilson, Attorney General
State of South Carolina
P.O. Box 11549
Columbia, South Carolina 29211

Myra Reece, Director
Environmental Affairs
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Dear Attorney General Wilson and Director Reece:

On October 18, 2021, the EPA received a Notice of Intent to bring suit from the Southern Environmental Law Center, on behalf of American Rivers and Upstate Forever, alleging that the EPA had a mandatory duty to review the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act of 2010 (SCWWA), S.C. Code Ann. §49-4-10 and its implementing regulations, S.C. Code Ann. Regs. §61-119 (R.61-119), for consistency with the Clean Water Act (CWA) and 40 C.F.R. Part 131.

The EPA has examined the SCWWA and R.61-119 in their entirety to determine whether any of the provisions constitute new or revised WQS under the CWA and EPA regulations, as informed by EPA guidance. As a result of this review, the EPA has determined that certain of the provisions are new WQS and are therefore subject to the Agency's review under Section 303(c) of the CWA and 40 C.F.R. Part 131. The EPA has the authority and duty to approve or disapprove these new WQS under the CWA Section 303(c)(3) because they are legally binding upon the state; address water quality criteria; set the desired condition for waterbodies in South Carolina; and are new WQS that have not been previously reviewed by the EPA under section 303(c).

The provisions that the EPA has concluded are new WQS are:

- S.C. Code Ann. §§ 49-4-20(14) and 49-4-150(A)(3) and S.C. Code Ann. Regs. §§ 61-119 section B(18) and section E(3)(a)(i)(B) Minimum instream flows;
- S.C. Code Ann. § 49-4-20(15) and S.C. Code Ann. Regs. § 61-119 section B(19) Minimum water levels;
- S.C. Code Ann. § 49-4-20(25) and S.C. Code Ann. Regs. § 61-119 section B(29) Safe yield; and,
- S.C. Code Ann. Regs. § 61-119 section E(3)(a)(ii)(A-D) Safe yield.

As discussed in the enclosed document, titled *Decision Document of the United States Environmental Protection Agency Review of the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act of 2010 and S.C. Code Ann. Regs. §61-119 Under § 303(c) of the Clean Water Act,* the EPA has reviewed these new WQS to determine whether they meet the requirements for approval in Section 303(c) of the CWA and 40 C.F.R. Part 131, has found that these provisions are not consistent with applicable legal requirements, and therefore disapproves the new WQS. Specifically, these provisions are not based on a sound scientific rationale as required by 40 C.F.R. § 131.5, do not protect the state's designated uses as required by 40 C.F.R. § 131.11, and do not provide for the attainment and maintenance of downstream WQS as required by 40 C.F.R. § 131.10. Accordingly, these provisions are not in effect for any CWA purposes and cannot be used for any CWA purposes even though they remain effective for state law purposes. For instance, these provisions cannot be used when issuing CWA Section 401 certifications in association with Section 404 permits, Federal Energy Regulatory Commission licenses, or other reviews requiring Section 401 certification. These provisions also cannot be used for water quality decisions under Section 303(d) and 305(b), Section 402 permitting, or for any other purposes under the CWA. Please note that these provisions should not be referred to as WQS. For instance, referring to the provisions as "protective stream flow criteria," or "flow standards," may create confusion and give the impression that the provisions are WQS that may be used for CWA purposes.

To remedy the Agency's disapproval and protect the state's designated and existing uses, South Carolina must take prompt action to develop protective hydrologic criteria during the current 2022 Triennial Review (CWA section 303(c)(3) and 40 CFR 131.22). Once those new water quality standards are in place, they must be implemented in conjunction with South Carolina Department of Health and Environmental Control's EPA-approved WQS under R.61-68 and 69 for all CWA purposes.

The EPA welcomes the opportunity to work with the state on the development of protective hydrologic criteria consistent with the CWA and 40 C.F.R. Part 131. The State should consider relevant Agency guidance when developing these criteria. The EPA is also available, if needed, to assist the State in the development of procedures to implement the new WQS.

Should you have any questions regarding this decision, please contact me at (404) 562-8357. If your staff has any questions, please contact Ms. Lisa Perras Gordon, at (404) 562-9317 or gordon.lisa-perras@epa.gov.

Sincerely,

Daniel Blackman
Regional Administrator

cc: Shawn Clarke, SC DHEC
Brenda Green, SC DHEC
Andrew Edwards, PE, SC DHEC

Decision Document of the United States Environmental Protection Agency Review of the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act of 2010 and S.C. Code Ann. Regs. Section 61-119 Under Section 303(c) of the Clean Water Act

The EPA has reviewed the South Carolina Surface Water Withdrawal, Permitting, Use and Reporting Act of 2010 (SCWWA), S.C. Code Ann. section 49-4-10 *et seq.* and its implementing regulation, S.C. Code Ann. Regs. section 61-119 (R.61-119), for consistency with the Clean Water Act (CWA) and 40 CFR Part 131. The EPA examined the SCWWA and R.61-119 to determine whether any provisions are new or revised water quality standards (WQS) that the EPA has the authority and duty to approve or disapprove under the CWA section 303(c)(3). As a result of that review, the EPA has determined that some provisions in the SCWWA and R.61-119 are new WQS. The EPA then reviewed those provisions for consistency with the CWA and the Agency's implementing regulations and found that they are not consistent with the requirements of the CWA and 40 CFR Part 131. Specifically, they are not based on a sound scientific rationale as required by 40 CFR sections 131.5 and 131.11, do not protect the State's designated uses as required by 40 CFR section 131.11, and do not provide for the attainment and maintenance of downstream WQS as required by 40 CFR section 131.10. Therefore, the EPA is disapproving those provisions pursuant to the CWA section 303(c), as detailed below, and they cannot be used for any CWA purpose.

I. Step 1. Review of SCWWA and R.61-119 to Determine Whether Provisions Are New or Revised WQS

The EPA has determined that some provisions in the SCWWA and R.61-119 constitute new WQS that the Agency has the authority and duty to approve or disapprove under section 303(c)(3) of the CWA. In brief, these provisions constitute new WQS within the meaning of section 303(c) of the CWA and under the EPA's regulation because they are legally binding upon the State; address water quality criteria; set the desired condition for waterbodies; and are new WQS that have not been previously approved by the EPA under section 303(c).

A. South Carolina's Existing WQS

WQS articulate the water quality goals of a water body by designating the use(s) and setting the criteria to protect those use(s). States adopt WQS to protect public health, enhance the quality of water, and serve the purposes of the CWA. WQS provide water quality for the protection and propagation of fish, shellfish and wildlife and recreation in and on the water, wherever attainable, and take into consideration the use and value of waters for public water supplies, agricultural, industrial, and other purposes including navigation. *See* 40 CFR section 131.2. Criteria are defined as elements of WQS "expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use." 40 CFR section 131.3(b).

The South Carolina Department of Health and Environmental Control's (SCDHEC or Department) EPA-approved WQS articulate in part that it is the purpose of the WQS to "establish a system and rules for managing and protecting the quality of South Carolina's surface…water" (R.61-68(A)(1)). The SCDHEC WQS also state that "[n]umeric criteria for aquatic life and human health are numeric values for specific parameters and pollutants or water quality levels which have been assigned for the

protection of the existing and classified uses," which include Freshwaters, Trout Waters, Outstanding Resource Waters, Outstanding National Resource Waters, Shellfish Harvesting Waters, Class SA, and Class SB waters. The State's narrative criteria for aquatic life and human health are "…goals and statements of attainable or attained conditions of biological integrity and water quality of the waterbody" (R.61-68(A)(1)(b)). The State's antidegradation rules provide, "a minimum level of protection to all waters of the State and also include provisions and requirements necessary to determine when and if water quality degradation is allowed" (R.61-68(A)(1)(c)). South Carolina's WQS seek to maintain water quality for waters which meet WQS, and where possible, improve water quality for waters that do not meet WQS, and emphasize "…a preventive approach in protecting waters of the State" (R.61-68(A)(2)-(3)).

The EPA-approved SCDHEC WQS at R.61-68 include the following provisions:

> A.4. It is a goal of the Department to maintain and improve all surface waters to a level to provide for the survival and propagation of a balanced indigenous aquatic community of flora and fauna and to provide for recreation in and on the water.
>
> B.12. Balanced indigenous aquatic community means a natural, diverse biotic community characterized by the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollutant tolerant species.
>
> B.19. Biological criteria, also known as biocriteria, mean narrative expressions or numeric values of the biological characteristics of aquatic communities based on appropriate reference conditions. Biological criteria serve as an index of aquatic community health.
>
> F.1.a. Narrative biological criteria in Section A.4. describe the goals of the Department to maintain and improve all surface waters to a level that provides for the survival and propagation of a balanced indigenous aquatic community of fauna and flora. These narrative criteria are determined by the Department based on the condition of the waters of the State by measurements of physical, chemical, and biological characteristics of the waters according to their classified uses.
>
> F.1.e. In the Class Descriptions, Designations, and Specific Standards for Surface Waters Section, all water use classifications protect for a balanced indigenous aquatic community of fauna and flora. In addition, Trout Natural and Trout Put, Grow, and Take classifications protect for reproducing trout populations and stocked trout populations, respectively.
>
> G. Class Descriptions, Designations, and Specific Standards for Surface Waters
>
> > 4. Outstanding National Resource Waters (ONRW) are freshwaters or saltwaters which constitute an outstanding national recreation or ecological resource.
> >
> > 6. Outstanding Resource Waters (ORW) are freshwaters or saltwaters which constitute an outstanding recreational or ecological resource or those freshwaters suitable as a source for drinking water supply purposes with treatment levels specified by the Department.
> >
> > 8. Trout Waters including Natural; Put, Grow, and Take; and Put and Take.

10. Freshwaters are freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department. Suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. Suitable also for industrial and agricultural uses.

11. Shellfish Harvesting Water are tidal salt waters protected for shellfish harvesting and uses listed in Class SA and Class SB. Suitable for primary and secondary contact recreation, crabbing, and fishing. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.

12. Class SA are tidal salt waters suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption and uses listed in Class SB. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora.

13. Class SB are tidal salt waters suitable for primary and secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption. Also suitable for survival and propagation of a balanced indigenous aquatic community of marine fauna and flora. Class SB has a less stringent criterion for dissolved oxygen than Class SA.

B. Analysis of Whether Provisions of the SCWWA and/or R.61-119 Are New or Revised WQS

CWA section 303(c)(2) requires states to submit new or revised WQS to the EPA. CWA section 303(c)(3) provides for the EPA review of such WQS. In this case, South Carolina did not submit the SCWWA or R.61-119 to the EPA for review. The EPA's authority and duty to review and approve or disapprove a new or revised WQS is not dependent upon whether the provision was submitted to the EPA for review.[1] Therefore, the EPA analyzed the SCWWA and R.61-119 to determine whether they contained any new or revised WQS.

In October 2012, the EPA posted a document online, entitled: "*What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions*" (FAQs).[2] The EPA developed the document as an aid to discern when state provisions constitute new or revised WQS, stating: "To date, the EPA has evaluated each situation on a case-by-case basis. These FAQs consolidate the EPA's plain language interpretation (informed by the CWA, the EPA's implementing regulation at 40 CFR part 131, and relevant case law) of what constitutes a new or revised water quality standard that the Agency has the CWA section 303(c)(3) authority and duty to approve or disapprove." The FAQs were, in part, an outgrowth of the Agency's experience in prior cases, and they are currently referenced in the EPA's *Water Quality Standards Handbook*. EPA's FAQs describe a 4-part test: if all four questions are

[1] The 11th Circuit has held that the EPA has a mandatory duty to act on new or revised state WQS, whether or not they are submitted to EPA. *Miccosukee Tribe of Indians of Florida v. EPA,* 105 F.3d 599 (11th Cir. 1997); *FPIRG v. EPA*, 386 F.3d 1070 (11th Cir 2004) (concurring with the reasoning in *Miccosukee*).

[2] *What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions.* Office of Water, U.S. Environmental Protection Agency. EPA No. 820-F-12-017 (October 2012) https://www.epa.gov/sites/default/files/2014-11/documents/cwa303faq.pdf

answered "yes," then the provision would likely constitute a new or revised WQS that the EPA has the authority and duty to approve or disapprove under CWA section 303(c)(3).

The EPA analyzed the SCWWA and R.61-119 consistent with the Agency's 4-part test to determine whether any provisions in the statute and/or regulation constitute new or revised WQS that the EPA has the authority and duty to approve or disapprove under the CWA section 303(c)(3). The 4-part test consists of the following questions:

1. Is it a legally binding provision adopted or established pursuant to state or tribal law?
2. Does the provision address designated uses, water quality criteria (narrative or numeric) to protect the designated uses, and/or antidegradation requirements for waters of the United States?
3. Does the provision express or establish the desired condition (e.g., uses, criteria) or instream level of protection (e.g., antidegradation requirements) for waters of the United States immediately or mandate how it will be expressed or established in such waters in the future?
4. Does the provision establish a new WQS or revise an existing WQS?

Question one is a threshold question of legal applicability that stems from the use of the terms "adopt," "law," "regulations," and "promulgate" in CWA section 303(a)-(c) and the EPA's regulations at 40 CFR 131.3(i) which specifies that WQS "are provisions of state or federal law."[3] Question two reflects the CWA articulation that WQS include three core components: designated uses, water quality criteria, and antidegradation requirements (see CWA sections 303(c)(2)(A) and 303(d)(4)(B)). Question three addresses the substance of the provision and whether it changes one or more of the components of a WQS, such that the provision expresses or establishes a different water quality goal for CWA purposes.[4]

Consistent with its placement as the final question, question four only needs to be evaluated if questions one through three are all answered in the affirmative. It clarifies that the EPA's authority, as specified in CWA section 303(c)(2)(A), is to act only on new or revised WQS provisions, which includes provisions that have not previously been approved by EPA under section 303(c).[5] The EPA's evaluation of whether a provision is new or revised requires a consideration of the effect of the provision on the WQS themselves. For example, if a provision meets the first three considerations but already exists as part of the state or authorized tribe's EPA-approved and CWA-applicable WQS and was only copied over to another section of the regulation for ease of reference, such a re-statement does not have the effect of establishing or changing the applicable WQS. Therefore, the provision is not new or revised, and the EPA does not have the authority or duty to take an action under CWA section 303(c).

Addressing question one, the SCWWA was passed by the South Carolina legislature and became effective on January 1, 2011, and is listed under Title 49 – Waters, Water Resources and Drainage under South Carolina Code of Laws. The SCDHEC promulgated rule R.61-119 in June 2012 to implement the legislation. Therefore, all provisions in the SCWWA and R.61-119 are legally binding and adopted pursuant to state law and satisfy question one of the EPA's 4-part test.

---

[3] 40 CFR 131.3(i): Water quality standards are provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses. Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act.

[4] See 40 CFR 131.2: A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria that protect the designated uses.

[5] As stated in EPA's 2012 4-part test FAQs "A provision that EPA has never approved as a WQS would be considered 'new.' It must also meet the other three considerations to be a new or revised WQS." *What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions.* Office of Water, U.S. Environmental Protection Agency. EPA No. 820-F-12-017 (October 2012) https://www.epa.gov/sites/default/files/2014-11/documents/cwa303faq.pdf

Addressing questions two and three, the EPA determined that the following provisions in the SCWWA and R.61-119 address water quality criteria and express the desired condition of all South Carolina surface waterbodies in terms of minimum instream flows, minimum water levels, and safe yields by creating new hydrologic criteria. In reaching this determination, the Agency analyzed the SCWWA and R.61-119, as explained below. Some of these provisions are included in both the SCWWA and R.61-119, while some provisions are in R.61-119 only. The EPA's analysis of how each provision meets questions 2 and 3 of the 4-part test is as follows:

- Minimum Instream Flow Provisions

  Provision One: Waters Not Influenced by Impoundments
  "Minimum instream flow" means the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set at forty (40) percent of the mean annual daily flow for the months of January, February, March, and April; thirty (30) percent of the mean annual daily flow for the months of May, June, and December; and twenty (20) percent of the mean annual daily flow for the months of July through November for surface water withdrawers as described in Section 49-4-150(A)(1). [SCWWA section 49-4-20(14); R.61-119 section B(18)]

  Provision Two: Waters Influenced by Impoundments
  For surface water withdrawal points located on a surface water segment downstream of and influenced by a licensed or otherwise flow controlled impoundment, "minimum instream flow" means the flow that provides an adequate supply of water at the surface water withdrawal point to maintain the biological, chemical, and physical integrity of the stream taking into account the needs of downstream users, recreation, and navigation and that flow is set in Section 49-4-150(A)(3). [SCWWA section 49-4-20(14); R.61-119 section B(18)], and

  For surface water withdrawal points located on a surface water segment downstream of and influenced by a licensed or otherwise flow controlled impoundment, the minimum instream flow shall be the flow specified in the license by the appropriate governmental agency. Surface water withdrawal points downstream of a licensed or otherwise flow controlled impoundment are considered to be influenced by the impoundment unless it can be demonstrated by the department through flow modeling and analysis of flow data that the withdrawal point is no longer materially influenced by the impoundment. The minimum instream flow set in this item does not apply to withdrawal points located downstream of an impoundment that are beyond the influence of the impoundment. [SCWWA section 49-4-150(A)(3); R.61-119 section E(3)(a)(i)(B)]

As noted above in section I.A. and as the EPA guidance explains, water quality criteria represent the conditions (e.g., concentrations of particular chemicals, levels of certain parameters, or narrative statements) sufficient to restore and maintain the chemical, physical, and biological integrity of water bodies, and protect applicable designated uses.[6] The minimum instream flow provisions, by their plain language, establish levels for a physical parameter "to maintain the biological, chemical, and physical integrity of the stream" taking into account various uses. In doing so, the EPA concludes that they

[6] U.S. Environmental Protection Agency (EPA). 2017. Water Quality Standards Handbook: Chapter 3: Water Quality Criteria. EPA-823-B-17-001. EPA Office of Water, Office of Science and Technology, Washington, DC. Accessed March 2022 at p. 1. https://www.epa.gov/sites/production/files/2014-10/documents/handbook-chapter3.pdf

establish new hydrologic criteria for state rivers and streams within the meaning of section 303(c) and the EPA's regulation. Therefore, they address water quality criteria to protect designated uses and satisfy the second question of the EPA's 4-part test.

The minimum instream flow provisions also satisfy the third question of the EPA's 4-part test because the provisions establish the desired condition for all rivers and streams in South Carolina, as described in more detail below.

Provision One sets a desired condition for minimum flows in rivers and streams not influenced by impoundments. These hydrologic criteria are based on a percentage of the mean annual daily flow of the river or stream.[7] Specifically, the criteria are 40% of the mean annual daily flow for the months of January, February, March, and April; 30% of the mean annual daily flow for the months of May, June, and December; and 20% of the mean annual daily flow for the months of July through November. Provision One asserts that these mean annual daily flow percentages will provide an adequate supply of water to "maintain the biological, chemical, and physical integrity" of South Carolina's rivers and streams. This language tracks the CWA's section 101(a) objectives of restoring and maintaining the chemical, physical, and biological integrity of the Nation's waters. Provision One specifies that these minimum instream flows will take into account flows needed to support designated uses, specifically recreation and navigation, as well as the needs of downstream users, in a manner that is indistinguishable from how states must set WQS for waterbodies under CWA section 303(c)(2)(A). By setting flow amounts intended to maintain the chemical, physical, and biological integrity of South Carolina's waters and to protect the designated uses, the provision establishes the desired condition for the waters.

Provision Two sets a desired condition for minimum flows in rivers and streams influenced by impoundments for the same reasons. These hydrologic criteria establish the minimum instream flows specified in a license issued by the appropriate government agency. Similar to Provision One, Provision Two states that these minimum instream flows will provide an adequate supply of water to "maintain the biological, chemical, and physical integrity" of South Carolina's rivers and streams and will take into account flows needed to support designated uses, specifically recreation and navigation, as well as the needs of downstream users, in a manner that is indistinguishable from how states must set WQS for waterbodies under CWA section 303(c)(2)(A). By setting flow amounts intended to maintain the chemical, physical, and biological integrity of South Carolina's waters and to protect the designated uses, the provision establishes the desired condition for the waters.

In conclusion, these provisions satisfy the third question of the EPA's 4-part test because they establish a desired condition by setting a water quality goal for rivers and streams in South Carolina to maintain minimum instream flows, as defined by the SCWWA and R.61-119.

- Minimum Water Level Provision
  "Minimum water level" means the water level in an impoundment necessary to maintain the biological, chemical, and physical integrity of the surface water in the impoundment taking into account downstream uses, withdrawals from the impoundment, and recreational and navigational needs as established by an existing federal regulatory process or established

[7] Mean annual daily flow is defined as, *"the arithmetic mean of individual daily mean discharges (stream flow) for a period representative of the historic stream flow records, using flow measurements published by USGS or as determined by other Department approved, hydrologically valid data." R.61-119 section B(16)*

through consultation between the department and the operator of the impoundment. [SCWWA section 49-4-20(15); R.61-119 section B(19)]

Like the minimum instream flow provisions, the minimum water level provision establishes levels for a physical parameter explicitly for the purpose of protecting uses. In doing so, it establishes new hydrologic criteria for impoundments. Therefore, this provision addresses water quality criteria to protect designated uses and satisfy the second question of the EPA's 4-part test.

The minimum water level provision also establishes, by its plain language, the desired condition for impoundments in South Carolina by setting a minimum water level intended to "maintain the biological, chemical, and physical integrity" of South Carolina impoundments. These hydrologic criteria are set by relying on the water levels established through existing regulatory processes or through consultation between the Department and the impoundment operator. The minimum water level provision states that these water levels will "maintain the biological, chemical, and physical integrity" of South Carolina's impoundments, tracking the language of the CWA's section 101(a) objectives, and will take into account downstream users and designated uses, specifically recreation and navigation, in a manner that is indistinguishable from how states must set WQS for waterbodies under CWA section 303(c)(2)(A). By setting water levels intended to maintain the chemical, physical, and biological integrity of South Carolina's waters and to protect the designated uses, the provision establishes the desired condition for the waters. In conclusion, this provision also satisfies the third question of the EPA's 4-part test because it establishes the desired condition by setting a water quality goal for impoundments in South Carolina to maintain minimum water levels, as defined by the SCWWA and R.61-119.

- Safe Yield Provision
  "Safe yield" means the amount of water available for withdrawal from a particular surface water source in excess of the minimum instream flow or minimum water level for that surface water source. Safe yield is determined by comparing the natural and artificial replenishment of the surface water to the existing or planned consumptive and nonconsumptive uses. [SCWWA section 49-4-20(25); R.61-119 section B(29)]

The safe yield provision establishes new hydrologic criteria for all South Carolina waters in the same manner as the minimum instream flow and minimum water level provisions, expressed as the inverse or the "safe" amount of water that is available for withdrawal. Therefore, it addresses water quality criteria to protect designated uses and satisfies the second question of the EPA's 4-part test.

The safe yield provision also establishes the desired condition for all waters in South Carolina by establishing the amount of water that remains available for withdrawal in excess of the applicable minimum instream flow or minimum water level. As previously noted, the minimum instream flow and minimum water level provisions set desired conditions for the minimum amounts of water intended to "maintain the biological, chemical, and physical integrity" of South Carolina's waters, while also taking into account downstream users and designated uses, specifically recreation and navigation. The safe yield provision also expresses those same instream flow and water level desired conditions by establishing the amount of water that can be withdrawn while still supporting the instream flow or water level. The safe yield provision is the inverse of the minimum instream flow and minimum water level provisions and therefore, this safe yield provision is similarly tied to the maintenance of the chemical, physical, and biological integrity of South Carolina's waters and protection of designated uses. By setting withdrawal amounts that are intended to be safe or protective, the provision is setting the desired condition. In conclusion, the safe yield provision satisfies the third question of the EPA's 4-part test

because it establishes the desired condition by setting a water quality goal for all surface waters in South Carolina to maintain minimum instream flows and minimum water levels, as defined by the SCWWA and R.61-119.

- Additional Safe Yield Provisions
  For withdrawals in a stream segment not influenced by a licensed or otherwise flow controlled impoundment, the safe yield is calculated as the difference between the mean annual daily flow and twenty (20) percent of mean annual daily flow at the withdrawal point, taking into consideration natural and artificial replenishment of the surface water and affected downstream withdrawals. [R.61-119 section E(3)(a)(ii)(A)]

  For withdrawals located on a stream segment materially influenced by a license or otherwise flow controlled impoundment, the safe yield is calculated as the difference between mean annual daily flow and the lowest designated flow in the license specified for normal conditions (non-drought) taking into consideration natural and artificial replenishment of the surface water and affected downstream withdrawals and natural attenuation of the stream flow between the licensed or otherwise flow controlled impoundment and the surface water withdrawal point. [R.61-119 section E(3)(a)(ii)(B)]

  For withdrawals from a licensed or otherwise flow controlled impoundment, safe yield is calculated as the maximum amount that would not cause a reservoir water level to drop below its minimum water level or to be able to release the lowest minimum flow specified in the license for that impoundment as issued by the appropriate governmental agency. [R.61-119 section E(3)(a)(ii)(C)]

  For withdrawals from an impoundment that is not considered a licensed or otherwise flow controlled impoundment under this regulation, the safe yield is calculated as the maximum amount that would not cause the impoundment water level to drop below its minimum water level as established by the Department with input from the applicant and the owner(s) and operator(s) of the impoundment consistent with E.3.i(C)(2) above. [R.61-119 section E(3)(a)(ii)(D)]

These additional safe yield provisions, which are found only in R.61-119, establish new hydrologic criteria for all South Carolina waters in the same manner as the minimum instream flow and minimum water level provisions, expressed as the inverse or the "safe" amount of water that is available for withdrawal. Therefore, they address water quality criteria to protect designated uses and satisfy the second question of the EPA's 4-part test.

These safe yield provisions also establish the desired condition for all waters in South Carolina and further elaborate on the more general safe yield definition in the SCWWA by establishing the amount of water that remains available for withdrawal as follows:

- The difference between the mean annual daily flow and twenty (20) percent of mean annual daily flow, for streams not influenced by a licensed or otherwise flow controlled impoundment; *or*
- The difference between the mean annual daily flow and the lowest flows specified in an operational license during non-drought conditions, for rivers and streams influenced by impoundments; *or*

- The maximum amount that would not cause an impoundment to go below its minimum water level or the ability to release the minimum flow specified in its license, for licensed or otherwise flow controlled impoundments; *or*
- The maximum amount that would not cause an impoundment to go below its minimum water level as established by the Department with input from the applicant and the owner(s) and operator(s) of the impoundment, for impoundments that are not considered licensed or otherwise flow controlled.

As previously noted, the minimum instream flow and minimum water level provisions set desired conditions for the minimum amounts of water intended to "maintain the biological, chemical, and physical integrity" of South Carolina waters, while also taking into account downstream users and designated uses, specifically recreation and navigation. These safe yield regulatory provisions also express those same instream flow and water level desired conditions by establishing the amount of water that can be withdrawn and still support the instream flow or water level. By stating how much water can be withdrawn, these safe yield provisions are the inverse of the minimum instream flow and minimum water level provisions and therefore, these safe yield provisions are similarly tied to the maintenance and protection of the chemical, physical, and biological integrity of South Carolina's waters and protection of designated uses. By setting withdrawal amounts that are intended to be safe or protective, the provisions are setting the desired condition. In conclusion, these safe yield provisions satisfy the third question of the EPA's 4-part test because they establish the desired condition by setting a water quality goal for all surface waters in South Carolina to maintain minimum instream flows and minimum water levels, as defined by the SCWWA and R.61-119.

Finally, addressing question four of the 4-part test, all the provisions analyzed above satisfy the first three questions and have not been previously approved by the EPA under section 303(c).[8] They are therefore all new WQS that satisfy the fourth question of the EPA's 4-part test.

Therefore, all four questions are answered "yes," and, as such, the EPA has concluded that the provisions are new WQS that the EPA has the authority and duty to approve or disapprove under CWA section 303(c)(3).

II. Step 2. Review of Provisions Found to be New WQS for Consistency with the CWA and Implementing Regulation

CWA section 303(c)(3) provides that the EPA will either approve or disapprove new or revised WQS, based on whether the WQS are "consistent with the applicable requirements" of the CWA. The EPA's regulations provide for the Regional Administrator to notify the state that the WQS are either approved or disapproved. (40 CFR section 131.21(a)). As specified in 40 CFR section 131.21(b), the Regional Administrator's action is to be based on the requirements of the CWA as described by the implementing regulation at 40 CFR sections 131.5 and 131.6. Those provisions refer to additional portions of 40 CFR Part 131, including sections 131.10 and 131.11. According to 40 CFR section 131.11(a), "States must adopt those water quality criteria that protect the designated use. Such criteria must be based on sound

[8] As stated in the EPA's 2012 4-part test FAQs "A provision that the EPA has never approved as a WQS would be considered 'new.' It must also meet the other three considerations to be a new or revised WQS." *What is a New or Revised Water Quality Standard Under CWA 303(c)(3)? Frequently Asked Questions.* Office of Water, U.S. Environmental Protection Agency. The EPA No. 820-F-12-017 (October 2012) https://www.epa.gov/sites/default/files/2014-11/documents/cwa303faq.pdf

scientific rationale and must contain sufficient parameters or constituents to protect the designated use." Furthermore, 40 CFR 131.10(b) provides that "In designating uses of a water body and the appropriate criteria for those uses, the State shall take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." In brief, the EPA finds that these new hydrologic criteria do not meet the requirements of the CWA, or 40 CFR Part 131 and these provisions are disapproved for all purposes under the CWA.

As described in Section E below - Scientific Background - scientific information on the hydrologic conditions necessary to support aquatic life has evolved considerably over the past several decades. This science has documented the detrimental impacts that alterations of flow in a waterbody can have on aquatic life, such as degrading species distribution and abundance and altering the composition and diversity of aquatic communities. For example, when flows decrease, pollutant concentrations, sedimentation, water temperature, and salinity in downstream waters can increase and dissolved oxygen levels can decrease. Nutrients, pH, and other parameters are also impacted by flow alterations. Increases in temperature due to extreme reductions of flow from withdrawals during the critical summer low flow period can cause detrimental biological impacts. The detrimental effects that can be associated with decreased flows, including on downstream waters, are explained more fully in Section E.

The information summarized in Section E informs but does not dictate the outcome of the EPA's evaluation of whether the new WQS identified in section I are consistent with the requirements of section 303(c) and the EPA's regulations. However, a wealth of scientific information has documented the detrimental impacts that reduction in flow can have on the integrity of waters, and this science has informed the Agency's analysis as to whether SCWWA and R.61-119 meet applicable legal requirements, in particular whether the provisions are based on sound science and protect designated uses. 40 C.F.R. 131.11(a). The EPA's review has taken into account, in particular, whether the degree of flow reduction associated with the desired condition of the waterbody set by the State's criteria would protect designated uses. As explained below, based on the record before the Agency, the EPA discerns no sound scientific rationale supporting the State's hydrologic criteria and concludes that the detrimental effects associated with the reduction in flow and water levels allowed by the State's criteria do not protect the designated uses contained in South Carolina's approved WQS. *See, e.g.,* SCDHEC WQS at R.61-68F.1.e ("all water use classifications protect for a balanced indigenous aquatic community of fauna and flora.").

A. Review of Minimum Instream Flow Provisions

South Carolina set hydrologic criteria for minimum instream flow for waters not influenced by impoundments (Minimum Instream Flow Provisions: Provision One) as percentages of the mean annual daily flow for specific months. The mean annual daily flow is a single calculated value that does not reflect the variability in flow levels that occurs during the year. As such, it does not represent the actual water present in a river or stream at any given point in time. For example, in using a mean annual daily flow the high spring flows are flattened and averaged out with the summer low flows to get a single calculated value, reflecting lower flows than are present in the spring and a higher flow value than would actually occur in the summer or early fall.

Specific percentages of the mean annual daily flow are set for different time periods as the amount of water that must remain instream to protect the integrity of the waters and protect the designated uses. The minimum amount that is required to remain in the waterbody is 40% of the mean annual daily flow

for the months of January, February, March, and April; 30% of the mean annual daily flow for the months of May, June, and December; and 20% of the mean annual daily flow for the months of July through November. Requiring those amounts to remain in the waterbody conversely means that 60% of the mean annual daily flow can be withdrawn for the months of January, February, March, and April; 70% of the mean annual daily flow can be withdrawn in May, June, and December; and 80% of the mean annual daily flow can be withdrawn in July through November. However, because the mean annual daily flow does not reflect how much water is actually in the waterbody at any given time, this could result in the removal of even higher percentages of the actual flow that occurs on any given day. There is no supporting evidence that removal of these percentages of the mean annual daily flow, as well as the flattening of the hydrograph that would occur if these water volumes were withdrawn throughout the year, would maintain the biological, chemical, and physical integrity of rivers and streams. To the contrary, published studies (e.g., Arthington 2006; Richter, 2010)[9] indicate that the significant alterations allowed by these criteria would almost certainly result in significant ecological degradation and therefore not protect designated uses.[10]

The minimum instream flow criteria for locations on rivers and streams influenced by impoundments (Minimum Instream Flow Provisions: Provision Two) are the flows specified in the license by the appropriate governmental agency. The process of negotiating a license may or may not address any impacts to the aquatic community, fishing, or recreation. Any minimum flows and levels resulting from such negotiations may be set based on a review of other community, industrial, or business goals and endpoints rather than any scientific rationale or protection of the applicable designated uses. These processes are not inherently designed to use a sound scientific method or model based on protecting a balanced indigenous aquatic community, as required by the designated uses in South Carolina's approved WQS. Nor is there supporting evidence that such licenses in South Carolina—which appear unconstrained from a water quality perspective— in fact specify flows that maintain the biological, chemical, and physical integrity of the river or stream.

In summary, the minimum instream flow hydrologic criteria set under the SCWWA and R.61-119 allow significant reduction of flows without any discernible sound scientific rationale and do not protect designated uses for waters to which they apply. The criteria therefore fail to meet the requirements of 40 CFR section 131.11.

B. Review of Minimum Water Level

South Carolina set hydrologic criteria for minimum water level for impoundments as established by an existing federal regulatory process or established through consultation between the Department and the operator of the impoundment. These processes may include updates to water control manuals or negotiated stakeholder agreements such as through the Federal Energy Regulatory Commission (FERC) licensing process or through other stakeholder negotiated processes for determining impoundment levels and minimum releases downstream of impoundments. As with the minimum instream flow provision for locations on rivers and streams influenced by impoundments, existing federal regulatory processes or consultations between the Department and impoundment operators may or may not address any impacts

[9] Arthington, A.H., Bunn, S.E., Poff, N.L. and Naiman, R.J. (2006). The Challenge of Providing Environmental Flow Rules to Sustain River Ecosystems. Ecological Applications 16: 1311-1318. https://doi.org/10.1890/1051-0761(2006)016[1311:TCOPEF]2.0.CO;2 ; Richter, B.D. (2010) Re-thinking environmental flows – From allocations and reserves to sustainability boundaries. River Research and Applications 28(8): 1052–1063. http://dx.doi.org/10.1002/rra.1320.

[10] To be clear, these studies cited as examples did not evaluate the specific percentages identified in South Carolina's statute and rules, nor South Carolina streams. These studies summarized the scientific literature and reached common conclusions related to flow alterations that are comparable or actually less altering than those identified in South Carolina's criteria.

to the aquatic community, fishing, or recreation. These processes are not inherently designed to use a sound scientific method or model based on protecting a balanced indigenous aquatic community, as required by the designated uses in South Carolina's approved WQS. Nor is there supporting evidence that such processes or consultations in South Carolina —which appear unconstrained from a water quality perspective—will in fact result in specification of levels that are based on sound scientific rationale or protect designated uses to which the criteria apply. The criteria therefore fail to meet the requirements of 40 CFR section 131.11.

C. Review of Safe Yield Provisions

Safe yield (or the amount of water that is considered 'safe' to withdraw) for rivers and streams not influenced by impoundments, is defined by the regulatory provision R.61-119 section E(3)(a)(ii)(A) as the difference between the mean annual daily flow and 20% of the mean annual daily flow at the withdrawal point. That is, the amount that is allowed to be withdrawn would be 80% of the mean annual daily flow throughout the year. Because the mean annual daily flow is a statistical value not correlated to how much water is actually in the waterbody at any given time, this could result in a calculated safe yield that is greater than the amount of water in a river or stream at certain times of the year. In those instances where a withdrawer is only subject to the safe yield provision and not required to meet minimum instream flow, there are no minimum amounts of water required to be left instream. Therefore, withdrawing the entire safe yield could allow removal of all the water in a waterbody during some times of the year, which would not maintain and support aquatic life. The potential to remove all water was acknowledged in comments by the South Carolina Department of Natural Resources,[11] which found that "for most streams, this 'safe yield' is greater than the median flow, meaning that the 'safe yield' will not be available more than half of the time." Since median flow is statistically the 50th percentile of a distribution of daily flow values, if the "safe yield" exceeds this median, then it could allow removal of all the water more than half the number of days in the year.

Safe yield for waterbodies influenced by impoundments or other flow control structures – as well as for impoundments themselves – is established by deferring to the minimum flows and levels specified through license agreements by the appropriate governmental agency, an existing federal regulatory process, or established through consultation between the Department and the operator of the impoundment. As stated above, these processes may include updates to water control manuals or negotiated stakeholder agreements such as through the FERC licensing process or through other stakeholder negotiated processes for determining impoundment levels and minimum releases downstream of impoundments.

The process of negotiating a license or operational agreement, the process of updating a water control manual, or the consultation process between the Department and the impoundment operator may or may not address impacts to the aquatic community, fishing, or recreation. In using such processes, any included minimum flows or levels may be set based on a review of other community, industrial, or business goals and endpoints rather than scientific rationale or protection of the designated uses. These processes are not inherently designed to use a sound scientific method or model based on protecting a balanced indigenous aquatic community, as required by the designated uses in South Carolina's approved WQS. Nor is there supporting evidence that such licenses, operational agreements, manuals, or consultations in South Carolina - which appear unconstrained from a water quality perspective - will in

[11] South Carolina Department of Natural Resources Comments on Proposed DHEC Surface Water Regulations R.61-119, *Surface Water Withdrawal, Permitting, Use and Reporting Act* version July 14, 2011. Submitted September 26, 2011.

fact result in specification of flows or levels that are based on sound scientific rationale or protect designated uses.

In summary, the safe yield hydrologic criteria set under the SCWWA and R.61-119 allow significant alteration of flows without any discernible sound scientific rationale for those criteria; nor do they protect designated uses for waters to which they apply. The criteria therefore fail to meet the requirements of 40 CFR section 131.11.

D. Consideration of WQS in Downstream Waters

In designating uses of a water body and the appropriate criteria for those uses, the State shall "take into consideration the water quality standards of downstream waters and shall ensure that its water quality standards provide for the attainment and maintenance of the water quality standards of downstream waters." (40 CFR 131.10(b)). As stated in the EPA's guidance, *Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions*[12] *(Downstream FAQs),* developing water quality criteria that ensure attainment and maintenance of downstream WQS may help to avoid situations where downstream segments become impaired due in part to, or directly because of, pollution in upstream segments. The *Downstream FAQs* note that states should consider waterbodies that "flow to downstream waters and may affect hydrologic flow…" and that "[d]ownstream impacts of upstream uses and criteria should be considered as far downstream as adverse impacts are observed or expected to occur from upstream pollution (including hydrologic flow alteration.)"

South Carolina's minimum instream flow, minimum water level, and safe yield provisions include language that references protection of downstream uses. However, the record before the EPA does not contain any support for concluding that the State took into consideration WQS for downstream waters or that the hydrologic criteria will, in fact, "provide for the attainment and maintenance of the water quality standards of downstream waters." (40 CFR 131.10(b)). As discussed above, the significant reductions in flow allowed by the criteria will almost certainly result in significant ecological degradation and therefore not protect designated uses for the waters to which the criteria apply. Similarly, such significant flow reductions can also result in substantial adverse downstream impacts. As described in the Scientific Background section, downstream bays and estuaries are dependent upon a characteristic pattern of freshwater flows from rivers and streams to support their aquatic life - affecting all levels of physical, chemical, and biological functions. Reduction of upstream flows at the levels allowed under these criteria could cause increases in salinity, exacerbate the effects of sea-level rise, and can adversely affect ecological function in saltwater systems[13] such as those classified Shellfish Harvesting Waters, Class SA, and Class SB waters. There is no basis to conclude that, in adopting the hydrologic criteria, South Carolina considered the WQS for downstream waters or that the criteria will provide for the attainment and maintenance of the WQS of downstream waters, as required by 40 CFR section 131.10(b).

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[12] *Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions*. EPA 820-F-14-001. U.S. Environmental Protection Agency. Office of Water, June 2014. https://www.epa.gov/sites/default/files/2018-10/documents/protection-downstream-wqs-faqs.pdf

[13] Copeland, B. J. 1966. Effects of decreased river flow on estuarine ecology. Journal of Water Pollution Control Federation 38:1831–1839; Powell, G.L., Matsumoto. J., and Brock, D.A. 2002. Methods for Determining Minimum Freshwater Inflow Needs of Texas Bays and Estuaries. Estuaries 25(6B): 1262–1274

E. Scientific Background

Scientific information on the hydrologic conditions necessary to support aquatic life has evolved considerably over the past several decades.[14] This science has documented the detrimental impacts that alterations of flow in a waterbody can have on aquatic life, such as degrading species distribution and abundance and altering the composition and diversity of aquatic communities.[15] Scientific evidence has supported the importance of a waterbody's characteristic flow pattern (including magnitude, timing, duration, frequency, and rate of change), or natural flow regime, for sustaining aquatic life; the dependence of downstream lake, bay, and estuary health on characteristic patterns of freshwater inputs; and the utility of a Sustainable Boundary Approach or Percentage of Flow approach as one possible method for developing general hydrologic standards that are protective of aquatic life.

To assist states and tribes in developing criteria, the EPA publishes, from time to time, information on the factors necessary to restore and maintain the chemical, physical, and biological integrity of all waters and the factors necessary for the protection and propagation of shellfish, fish, and wildlife and to allow recreation on the water. (CWA 304(a)(2)). In addition, from time to time, the EPA provides states and tribes with information on the processes, procedures, and methods to control pollution, defined as "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water," (CWA section 502(19)). The CWA specifies that this includes pollution caused by the changes in the movement, flow, or circulation of any navigable waters or groundwaters, including changes caused by the construction of dams, levees, channels, causeways, or flow diversion facilities. (CWA 304(f)).

Most recently, consistent with sections 304(a)(2) and 304(f) of the CWA, and in conjunction with the United States Geological Survey (USGS), the EPA published the *Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration*[16] (*EPA-USGS Technical Report*) to provide scientific information that states, and tribes could use in their efforts to advance the protection of aquatic life from the adverse effects of this type of pollution in rivers and streams. The *EPA-USGS Technical Report* includes information that the states and tribes are encouraged to use to develop and implement scientifically sound, protective hydrologic criteria, as well as potential means of addressing these protections through other CWA programs. It is a non-binding document and does not mandate any particular approach, but rather presents a literature review, examples of narrative criteria that some states and tribes have adopted, and a flexible, non-prescriptive framework for identifying biological goals and evaluating effects on aquatic life under varying degrees of flow alteration.

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[14] Arthington, A.H., Bunn, S.E., Poff, N.L. and Naiman, R.J. (2006). The Challenge of Providing Environmental Flow Rules to Sustain River Ecosystems. Ecological Applications 16: 1311-1318. https://doi.org/10.1890/1051-0761(2006)016[1311:TCOPEF]2.0.CO;2 ; Novak, R., *et al.* 2016. *Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration*: U.S. Geological Survey Scientific Investigations Report 2016–5164, U.S. Environmental Protection Agency EPA Report 822-R-156-007, 156 p. https://www.epa.gov/sites/default/files/2016-12/documents/final-aquatic-life-hydrologic-alteration-report.pdf ; Poff, N.L., Allan, J.D., Bain, M.B., Karr, J.R., Prestegaard, K.L., Richter, B.D., Sparks, R.E., and Stromberg, J.C. (1997). The Natural Flow Regime A paradigm for river conservation and restoration. BioScience 47(11): 769-784.; Richter, B.D. 2010. Re-thinking environmental flows – From allocations and reserves to sustainability boundaries. River Research and Applications 28(8): 1052–1063. http://dx.doi.org/10.1002/rra.1320 .

[15] Bunn, S.E., and Arthington, A.H. 2002. Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity. Environmental Management 30(4): 492–507. http://dx.doi.org/10.1007/s00267-002-2737-0.

[16] Novak, R., *et al.* 2016. *Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration*: U.S. Geological Survey Scientific Investigations Report 2016–5164, U.S. Environmental Protection Agency EPA Report 822-R-156-007, 156 p. https://www.epa.gov/sites/default/files/2016-12/documents/final-aquatic-life-hydrologic-alteration-report.pdf

Based on the results of a contemporary environmental flow[17] literature search, the *EPA-USGS Technical Report* found that "[p]rotecting aquatic life from the effects of flow alteration involves maintaining multiple components of the flow regime within their typical range of variation." The study of how the ecology of aquatic ecosystems changes in relationship to flow (flow-ecology) has demonstrated that aquatic life depends on each of the components of a natural flow regime reflecting the natural variation of flow conditions over space and time. The study of flow-ecology seeks to create linkages and define the relationship between alterations in flow and ecological responses.[18] This characteristic flow pattern, or natural flow regime, supports the integrity of aquatic life by maintaining habitat of sufficient size, character, diversity, and connectivity as well as providing cues for spawning, migration, and other life history stages. Restoring and maintaining a natural flow regime has also been shown to increase system resilience to climate change.[19]

Conversely, alteration of a natural flow regime can have cascading effects on the physical, chemical, and biological properties of waterbodies, which can lead to the degradation of aquatic life. For example, when flows decrease, pollutant concentrations, sedimentation, water temperature, and salinity in downstream waters can increase and dissolved oxygen levels can decrease. Nutrients, pH, and other parameters are also impacted by flow alterations. Increases in temperature due to extreme reductions of flow from withdrawals during the critical summer low flow period can cause detrimental biological impacts.[20] Reductions in flow alter lateral and longitudinal hydrologic connectivity, resulting in the reduction of survival of migratory fish, loss of high-quality habitat, and impacts to adjacent riparian areas. The loss of access to floodplains limits access to important reproduction and feeding areas, refugia, and rearing habitat for native species. More frequent low-flow conditions can reduce sensitive taxa diversity and abundance, and cause mortality. Altering of flows can remove the flow and temperature cues needed for aquatic species to complete their life cycles, eliminating the hydrologic cues needed to stimulate spawning. This has been shown to increase the establishment of invasive species. The most severe of alterations, when stream segments are dewatered, will result in the complete extirpation of aquatic species in those waterbodies.[21]

Similarly, downstream bays and estuaries are dependent upon a characteristic pattern of freshwater flows from rivers and streams to support their aquatic life - affecting all levels of physical, chemical, and

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[17] "Environmental flows describe the quantity, timing, and quality of water flows required to sustain freshwater and estuarine ecosystems and the human livelihoods and well-being that depend on these ecosystems… Environmental flows are essential for freshwater ecosystem health and human well-being." The Brisbane Declaration on Environmental Flows (2007). https://riversymposium.com/about/brisbane-declaration/

[18] Poff, L.N. *et al.* 2010, The ecological limits of hydrologic alteration (ELOHA) – A new framework for developing regional environmental flow standards. Freshwater Biology 55(1): 147–170.

[19] Novak, R., *et al.* 2016. *Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration*: U.S. Geological Survey Scientific Investigations Report 2016–5164, U.S. Environmental Protection Agency EPA Report 822-R-156-007, 156 p. https://www.epa.gov/sites/default/files/2016-12/documents/final-aquatic-life-hydrologic-alteration-report.pdf ; Palmer, M.A., Lettenmaier, D.P., Poff, N.L., Postel, S.L., Richter, B.D., and Warner, R. 2009. Climate change and river ecosystems – Protection and adaptation options. Environmental Management 44(6): 1053–1068. http://dx.doi.org/10.1007/s00267-009-9329-1 ; U.S. Global Change Research Program. 2018. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*. [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA. 1515 pp. http://dx.doi.org/10.7930/NCA4.2018

[20] Novak, R., *et al.* 2016. *Final EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration*: U.S. Geological Survey Scientific Investigations Report 2016–5164, U.S. Environmental Protection Agency EPA Report 822-R-156-007, 156 p. https://www.epa.gov/sites/default/files/2016-12/documents/final-aquatic-life-hydrologic-alteration-report.pdf

[21] *Id.*

biological functions.[22] Characteristic timing and delivery of freshwater flows are critical for estuarine circulation patterns, salinity gradients, sediment transport, temperature, oxygen levels, and nutrient supplies.[23] These processes support habitat and nursery areas, sea grass beds, spawning, and the maintenance of species composition and abundance.[24] The timing and delivery of upstream freshwater flows has been identified as a major factor for bay and estuary biological productivity, such as shellfish harvesting and fisheries. Anthropogenic reductions of flow, and changes to the timing and delivery of freshwater flows, can create hypersaline conditions, change habitat, and drastically alter estuarine species composition.[25] Lakes have also adapted to hydrologic conditions to support aquatic life. Significant alterations of input flows can impact fishing and recreational uses.

Numerous approaches can be used to develop scientifically defensible site-specific hydrologic criteria, but this process can be time-consuming. Over the past 20 years, when more general approaches have been needed, hydrologic standards have increasingly been based on a Sustainable Boundary Approach or a Percentage of Flow approach, which preserves characteristic flow patterns that support aquatic life by allowing ecologically sustainable deviations from natural conditions.[26] These deviations from natural conditions are based on short time steps and have been found to be more protective than a minimum instream flow standard alone.[27]

III. EPA Action

For the reasons stated above, the EPA finds that the provisions for minimum instream flow, minimum water level, and safe yield constitute new WQS that the EPA has the authority and duty to approve or disapprove under CWA section 303(c)(3). Based on its review, the EPA concludes that these provisions are not consistent with the CWA or its implementing regulation. Specifically, they are not based on a sound scientific rationale, do not protect the State's designated uses, and do not provide for the attainment and maintenance of downstream WQS. *See* 40 CFR sections 131.5, 131.10(b), and 131.11(a)(1). Therefore, the EPA disapproves these provisions because they do not comply with the requirements of the CWA and 40 CFR Part 131.

A. Effect of Disapproval

While the disapproved provisions remain in effect for state law purposes, under 40 CFR section 131.21(e), these provisions are not in effect under the CWA and cannot be used for any CWA purpose, including but not limited to: any certification issued pursuant to section 401 of the CWA (e.g.,

[22] Copeland, B. J. 1966. Effects of decreased river flow on estuarine ecology. Journal of Water Pollution Control Federation 38:1831–1839; Powell, G.L., Matsumoto. J., and Brock, D.A. 2002. Methods for Determining Minimum Freshwater Inflow Needs of Texas Bays and Estuaries. Estuaries 25(6B): 1262–1274.
[23] Powell, G.L., Matsumoto. J., and Brock, D.A. 2002. Methods for Determining Minimum Freshwater Inflow Needs of Texas Bays and Estuaries. Estuaries 25(6B): 1262–1274.
[24] Alber, M. 2002. A Conceptual Model of Estuarine Freshwater Inflow Management. Estuaries 25(6B): 1246–1261.; Harte Research Institute for Gulf of Mexico Studies. 2014. Freshwater Inflows. https://www.freshwaterinflow.org/introduction/
[25] Copeland, B. J. 1966. Effects of decreased river flow on estuarine ecology. Journal of Water Pollution Control Federation 38: 1831–1839; Alber, M. 2002. A Conceptual Model of Estuarine Freshwater Inflow Management. Estuaries 25(6B): 1246–1261.
[26] Richter, B.D. 2010. Re-thinking environmental flows – From allocations and reserves to sustainability boundaries. River Research and Applications 28(8): 1052–1063. http://dx.doi.org/10.1002/rra.1320; Driver, L.J., Cartwright, J.M., Knight, R.R., and Wolfe, W.J. 2020. Species-Richness Responses to Water-Withdrawal Scenarios and Minimum Flow Levels: Evaluating Presumptive Standards in the Tennessee and Cumberland River Basins. Water 12(5): 1334. https://doi.org/10.3390/w12051334
[27] Richter, B.D. 2010. Re-thinking environmental flows – From allocations and reserves to sustainability boundaries. River Research and Applications 28(8): 1052–1063. http://dx.doi.org/10.1002/rra.1320

certification related to permits issued by the Army Corps of Engineers under section 404 of the CWA or issuance of licenses by the FERC); identification of impaired waters under sections 303(d) and 305(b) of the CWA, or issuance of NPDES permits under section 402 of the CWA.

B. Remedy

To remedy the Agency's disapproval and protect the state's designated and existing uses, South Carolina must adopt hydrologic criteria that are consistent with the requirements of the CWA and the EPA's implementing regulation and submit them to the EPA pursuant to section 303(c) and 40 CFR 131.22.[28] The EPA strongly encourages South Carolina to consider the scientific information summarized in this document and in the documents cited herein to assist in this regard. Consistent with 40 CFR 131.6(b), the State must submit to the EPA the methods and analyses conducted to support such criteria. The hydrologic criteria must be based on sound scientific rationale, sufficient to protect the applicable designated uses, take into consideration the WQS of downstream waters, and provide for the attainment and maintenance of such downstream standards. The hydrologic criteria must be consistent with the antidegradation policy requirements in 40 CFR section 131.12. *See* 40 CFR sections 131.5, 131.6, 131.10, 131.11, and 131.12.

Once hydrologic criteria are adopted by the State and approved by the EPA, they will apply, in conjunction with the SCDHEC's CWA effective WQS under R.61-68 and 69, for CWA purposes, including but not limited to section 401 certifications, section 402 NPDES permits, any other CWA permitting or reviews, and assessment of state water quality under sections 303(d) and 305(b). The EPA welcomes the opportunity to work with the Department on the development of these WQS consistent with the CWA and 40 CFR Part 131 and informed by relevant guidance.

IV. Provisions in SCWWA and R.61-119 EPA is Not Acting on Under CWA 303(c)(3)

EPA determined that it does not have the authority or duty to act on any of the remaining provisions in the SCWWA and R.61-119 under CWA section 303(c)(3). In brief, after careful review, the EPA has concluded that the provisions either do not meet all 4 questions of the 4-part test or they are definitions that are not at this time defining terms in any EPA-approved, CWA-effective WQS. These state law provisions remain in effect in South Carolina but may not be used for CWA purposes because they are not approved by the EPA.

_____ _____

Date

Daniel Blackman
Regional Administrator

[28] Response to public comments during the 2019 Triennial review, "The Department recognizes the importance of stream flow protection. The Department is currently working to determine appropriate narrative stream flow standards. Following this Triennial Review, the Department plans to initiate a separate rulemaking process focused on stream flow standards" SCDHEC to EPA, March 2021.

Inventory of Below WMA Threshold Water Withdrawal Sources in the Ipswich and Parker River Watersheds

Completed for

University of Massachusetts Donahue Institute
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Massachusetts Dept. of Environmental Protection
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Completed by

Comprehensive Environmental Inc.
225 Cedar Hill Street
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October 12, 2018

Executive Summary

The Water Management Act (WMA) Program regulates withdrawals for all entities that withdraw at least 9 million gallons over a 90 day period (i.e. at or above 100,000 gallons per day (gpd) for at least 3 consecutive months) through registrations and/or permits. These entities are required to annually report their withdrawals to the Massachusetts Department of Environmental Protection (MassDEP). Withdrawals below this threshold are not regulated or reported unless the water use entity is classified as a public water supplier (PWS). MassDEP's Drinking Water Program (DWP) regulates approximately 1,750 Public Water Supplies (PWSs) (defined as providing drinking water to 15 service connections or serves an average of at least 25 people for at least 60 days a year). The purpose of this project was to inventory water supply sources not regulated by the WMA, essentially those sources withdrawing less than 100,000 gpd. The water source inventory is limited to the Parker and Ipswich River Basins which are known to experience low streamflow. The information from the study was used to quantify the cumulative volumes withdrawn not currently regulated by the WMA Program, for the purposes of this study defined as below WMA threshold withdrawals.

Below WMA threshold sources of supply identified by this study include: residential wells used for drinking water, irrigation, or both; wells and surface water sources used for irrigation at large private properties (agriculture, golf courses, housing complexes, retail property, industry, non-profit institutions, etc.); municipal irrigation sources (playing fields and other municipally owned property); and water supply sources used at commercial and industrial facilities with potential high water use such as car washing and concrete batching.

Available data on below WMA threshold regulated wells were collected from MassDEP's on-line SearchWell database, individual communities through Boards of Public Health and MassDEP's records of below WMA threshold PWS's. This data was used to locate and categorize the wells within the Ipswich and Parker River Basins. Upon examination, it was determined that there were data gaps in the identification of these wells. For example, there are developed parcels located outside the boundaries of municipal PWS's without a well recorded in any of the databases, but which were assumed to have a supply well. It was necessary to add assumed wells to the list of wells tabulated for this study for these instances. For areas within municipal PWS boundaries, only the private wells identified through the available database records were included.

Water withdrawals for the below WMA threshold withdrawal wells or surface water sources were estimated for the following categories:

1. Residential domestic demand (non-irrigation)
2. Residential irrigation outside municipal PWS boundaries
3. Residential irrigation inside municipal PWS boundaries using private wells
4. Golf courses inside and outside PWS boundaries using private irrigation sources (wells or surface water)
5. Withdrawals inside and outside PWS boundaries using private sources for agricultural irrigation and livestock maintenance
6. Playing fields inside and outside PWS boundaries using irrigation-only sources
7. Concrete batching inside and outside PWS boundaries using private sources
8. Car washes inside and outside PWS boundaries using private sources

Estimated below WMA threshold withdrawals were calculated for the annual year, average day and August average day for comparison with WMA regulated withdrawals.

WMA regulated withdrawals represent approximately 95% of the total annual withdrawals within the Ipswich Basin and approximately 80% of total annual withdrawals within the Parker Basin. Below WMA threshold withdrawals represent approximately 5% of the total annual withdrawals within the Ipswich Basin and approximately 20% of the total annual withdrawals within the Parker Basin.

When compared with the total annual withdrawals, irrigation with irrigation only sources in the Ipswich Basin represents approximately 3% of the total annual withdrawals while in the Parker Basin it represents approximately 10% of the total annual withdrawals. These irrigation withdrawal percentages include residential irrigation outside and inside municipal PWS boundaries, golf course irrigation, agricultural irrigation and playing field irrigation.

For the below threshold irrigation withdrawals that may be considered nonessential (those not for operation of a business), the residential private well irrigation represents approximately 1.4% of total annual withdrawals in the Ipswich Basin and approximately 3.9% of total annual withdrawals in the Parker Basin. Within the Ipswich Basin, these withdrawals are approximately 117.69 million gallons per year (MGY) or 0.77 million gallons per day (mgd) assuming withdrawals occur over 153 days (growing season occurring May 1 – September 30), with an August average day withdrawal of 1.16 mgd. Within the Parker Basin, these withdrawals are approximately 34.89 million gallons per year (MGY) or 0.23 million gallons per day (mgd) assuming withdrawals occur over 153 days, with an August average day withdrawal of 0.35 mgd. The August average day withdrawals are greater than the growing season average day withdrawals since water for uses such as irrigation are assumed to be greater during August due to typical weather conditions.. The difference in nonessential withdrawals between the Ipswich and the Parker Basins is due to basin size and the residential irrigation areas estimated for this study.

The study included examination of the number of irrigation wells installed after the issuance of WMA permits or Interbasin Transfer Act approvals that required restrictions on nonessential outdoor water use. Note that current private well databases and municipal records have limited information on well details. Approximately 32% of municipal records of private wells within the study area included installation dates. Of the private wells recorded with installation dates, approximately 81 wells were installed after nonessential outdoor water use restrictions were required by the local PWS. This is 9% of the total number of wells that have recorded installation dates. The available recorded data suggest that there has not been a large increase in the number of private wells installed after the issuance of permits with restrictions on nonessential outdoor water use, although there is inconsistent and incomplete private well data among and within study area communities.

In conclusion, the majority of water withdrawn within the Ipswich and Parker Basins is regulated under the WMA. For the withdrawals not currently regulated under the WMA, the amount attributable to nonessential outdoor water use is low compared to total withdrawals. The Ipswich and Parker Basin combined withdrawals total approximately 9,192 million gallons per year (MGY), while approximately 152.58 MGY, or 1.7% of the total annual non WMA regulated withdrawals, are for nonessential outdoor water use (residential irrigation). The average day withdrawal (calculated based

on the number of withdrawal days) for the two basins totals 26.8 mgd, while approximately 1.0 mgd or 3.7% of the average day withdrawals is for non-essential outdoor water use. For the August average day withdrawal, the combined total is 29.3 mgd for the two basins, while approximately 1.5 mgd or 5.1% of the August average day withdrawals is for non-essential outdoor water use. Note that both the average day and August average day withdrawals are a factor of multiple components and for several withdrawal categories the August withdrawals were assumed to be greater than both annual average and summer average day withdrawals. For example, residential irrigation for August was assumed to be greater than the summer average due to typical weather conditions. The report includes more detailed descriptions on how the withdrawals were estimated for the various withdrawal categories.

since this information is reported on their Annual Statistical Reports. There may also be a small number of commercial entities that do not exceed the threshold for classification as a PWS. For the purposes of this analysis, water use by these entities is assumed to be low in comparison with other water uses already identified and within the margin of error inherent within a study area of this size.

5.9 Summary

Water use was estimated for a variety of below WMA threshold withdrawers as presented in this Section. **Table 5-21** presents a summary of the water withdrawal estimates in average day demand. **Table 5-22** presents a summary of the water withdrawal estimates in August average day demand. **Table 5-23** presents a summary of the water withdrawal estimates in annual total.

Table 5-21. Estimated Below WMA Threshold Withdrawals - Average Day

Basin	Ipswich Basin[1,2]			Parker Basin[1,2]		
	Min (mgd)	Average (mgd)	Max (mgd)	Min (mgd)	Average (mgd)	Max (mgd)
Below WMA Threshold PWS Water Use (Metered data)	0.021	0.022	0.024	0.005	0.006	0.009
Residential Indoor Use with Private Wells	0.460	0.510	0.560	0.210	0.230	0.250
Residential Irrigation with private wells Outside Municipal PWS	0.120	0.230	0.350	0.070	0.130	0.200
Residential Irrigation with private wells Inside Municipal PWS	0.270	0.540	0.810	0.050	0.100	0.150
Below WMA Threshold Golf Course Irrigation	0.23	0.307	0.384	0.168	0.224	0.28
Below WMA Threshold Agricultural Water	0.270	0.500	0.740	0.090	0.150	0.220
Playing Field Irrigation Outside of Municipal PWS	0.026	0.051	0.077	0.011	0.023	0.034
Playing Field Irrigation with Irrigation Wells Inside Municipal PWS	0.037	0.074	0.111	0.000	0.000	0.000
Car Washes with Private Wells	0.005	0.005	0.006	0.000	0.001	0.001
Concrete Batching with Private Wells	0.056	0.084	0.112	0.003	0.004	0.006
Total	**1.494**	**2.323**	**3.173**	**0.608**	**0.867**	**1.149**

[1] For the purposes of this study, below WMA threshold withdrawals are defined as those that are not currently regulated through the WMA program. In most cases these withdrawals are below the WMA regulatory threshold of 9 million gallons over a 90 day period (i.e. 100,000 gallons per day (gpd) for at least 3 consecutive months). There may be some withdrawals presently classified as below WMA threshold for this study that may require review by MassDEP to determine whether these withdrawals should be regulated through the WMA program.
[2] Average day is based on number of withdrawal days which is 365 days for year round withdrawals, 153 days for residential, agricultural and playing field irrigation and 92 days for golf course irrigation.

Table 5-22. Estimated Below WMA Threshold Withdrawals - August Average Day

Basin	Ipswich Basin[1]			Parker Basin[1]		
	Min (mgd)	Average (mgd)	Max (mgd)	Min (mgd)	Average (mgd)	Max (mgd)
Below WMA Threshold PWS Water Use (Metered data)	0.021	0.023	0.026	0.004	0.006	0.009
Residential Indoor Use with Private Wells	0.460	0.510	0.560	0.210	0.230	0.250
Residential Irrigation with private wells Outside Municipal PWS	0.230	0.350	0.440	0.130	0.200	0.250
Residential Irrigation with private wells Inside Municipal PWS	0.540	0.810	1.010	0.100	0.150	0.190
Below WMA Threshold Golf Course Irrigation	0.307	0.384	0.48	0.168	0.28	0.35
Below WMA Threshold Agricultural Water	0.500	0.740	0.810	0.150	0.220	0.240
Playing Field Irrigation Outside of Municipal PWS	0.051	0.077	0.085	0.011	0.023	0.038
Playing Field Irrigation with Irrigation Wells Inside Municipal PWS	0.074	0.111	0.122	0.000	0.000	0.000
Car Washes with Private Wells	0.005	0.005	0.006	0.001	0.001	0.001
Concrete Batching with Private Wells	0.056	0.084	0.112	0.003	0.004	0.006
Total	**2.244**	**3.094**	**3.650**	**0.777**	**1.114**	**1.333**

[1] For the purposes of this study, below WMA threshold withdrawals are defined as those that are not currently regulated through the WMA program. In most cases these withdrawals are below the WMA regulatory threshold of 9 million gallons over a 90 day period (i.e. 100,000 gallons per day (gpd) for at least 3 consecutive months). There may be some withdrawals classified as below WMA threshold for this study that may require review by MassDEP to determine whether these withdrawals should be regulated through the WMA program.

Table 5-23. Estimated Below WMA Threshold Withdrawals – Annual

Basin	Ipswich Basin[1,2]			Parker Basin[1,2]		
	Min (mgd)	Average (mgd)	Max (mgd)	Min (mgd)	Average (mgd)	Max (mgd)
Below WMA Threshold PWS Water Use (Metered data)	7.7	8.0	8.8	1.6	2.0	2.6
Residential Indoor Use with Private Wells	167.0	186.0	205.0	76.5	85.0	93.5
Residential Irrigation with private wells Outside Municipal PWS	18.4	35.2	53.6	10.7	19.9	30.6
Residential Irrigation with private wells Inside Municipal PWS	41.1	82.5	123.8	7.5	15.0	22.4
Below WMA Threshold Golf Course Irrigation	21.2	28.3	35.4	15.3	20.4	25.5
Below WMA Threshold Agricultural Water	44.0	81.0	117.0	15.0	25.0	36.0
Playing Field Irrigation Outside of Municipal PWS	3.9	7.8	11.8	1.7	3.5	5.2
Playing Field Irrigation with Irrigation Wells Inside Municipal PWS	5.6	11.3	16.9	0.0	0.0	0.0
Car Washes with Private Wells	1.6	1.7	1.9	0.2	0.2	0.2
Concrete Batching with Private Wells	6.7	10.1	13.4	0.3	0.5	0.7
Total	**317.1**	**452.0**	**587.6**	**128.8**	**171.5**	**216.7**

[1] For the purposes of this study, below WMA threshold withdrawals are defined as those that are not currently regulated through the WMA program. In most cases these withdrawals are below the WMA regulatory threshold of 9 million gallons over a 90 day period (i.e. 100,000 gallons per day (gpd) for at least 3 consecutive months). There may be some withdrawals classified as below WMA threshold for this study that may require review by MassDEP to determine whether these withdrawals should be regulated through the WMA program.
[2] Annual withdrawals are based on number of withdrawal days which is 365 days for year round withdrawals, 153 days for residential, agricultural and playing field irrigation and 92 days for golf course irrigation.

IPSWICH RIVER
WATERSHED ASSOCIATION

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Inventory of Below WMA Threshold Water Withdrawal Sources
in the Ipswich and Parker River Watersheds
Massachusetts Department of Environmental Protection
October 12, 2018

A critique by
The Ipswich River Watershed Association
8/7/19

Background

On May 16, 2019, the above study was released by MassDEP. The study was one of three projects outlined in DEP's September 22, 2017 denial of the Massachusetts Rivers Alliance petition to DEP to impose conservation standards on registrations and consider same on certain below threshold withdrawals. The study chose these two particularly stressed watersheds to base their study upon and sought to quantify the probable range of these cumulative withdrawals. This study followed a comparable albeit more limited study of same by the Ipswich River Watershed Association (IRWA) in 2016 which estimated that a minimum of nearly 3 million gallons per day (mgd) were being withdrawn from these sources on average and that this class of withdrawals was growing, in part due to water conservation restrictions imposed by many of the municipalities in the watershed. This critique stems from the significant discrepancy in the conclusions reached by the DEP and IRWA studies. The critique is limited to the withdrawals in the Ipswich Basin and makes no conclusions relative to those in the Parker Basin which were also a subject of the DEP study.

MassDEP Cover Letter

The cover letter by DEP summarizing the study makes several unsubstantiated, misleading and perhaps erroneous conclusions based on the actual results of the study. Specifically:

1. The letter quotes that "95% of the total annual withdrawals in the Ipswich River are regulated by the WMA Program." While this statement may be factually accurate based on the limited conclusions of the study (more on this below) and the fact that registrations are considered part of the WMA program, it is misleading at best since registrations have no regulatory conditions placed upon them and make up nearly 90% of the withdrawals in the Ipswich governed by the WMA (assuming Salem-Beverly is functionally registered). When coupled with the below threshold withdrawals estimated by IRWA, nearly 95% of the overall withdrawals in the Ipswich have no use regulations placed upon them, which is exactly opposite of the implication of the DEP statement. Moreover, since the entire purpose of the petition was to put regulatory

conservation conditions upon registrations and consider doing the same on certain below threshold withdrawals, DEP's statement is both confusing and misleading.

2. The letter states that: "Irrigation by private wells, golf courses and farms represent 3% of the withdrawals in the Ipswich." First, as enumerated below, the DEP study significantly underestimates the actual total. Second, the study identified several areas where data on below threshold withdrawals could not be gathered since records do not exist (e.g. wells installed prior to the year 2000). Third, the study missed some large-scale withdrawals. This sizable data gap could represent a large amount of water, and the uncertainty inherent in any conclusions relying in part on missing or potentially inaccurate data should be acknowledged in the cover letter. Moreover and perhaps most importantly, the amount of water withdrawn from a watershed on an annual basis has little relationship with its environmental impacts, which was the focus of the petition. According to USGS and DFG SWMI-science, environmental impact is determined by when, where and how these withdrawals are made, and not by how much the overall withdrawal amounts to. DEP's adopted science and sub-basin stream classification scheme used in WMA permitting determined that a tiny fraction of annualized withdrawals (on the order of a few percentage points of overall withdrawals) are the primary reason that 20% of the state's sub basins in Massachusetts are classified as severely stressed. As such, this statement can be interpreted as designed to misrepresent the potential impact of these withdrawals.
3. The letter concludes "Data…suggests that there has not been a large increase in the number of private wells installed after outdoor water restrictions were included in permits." This statement, while accurate on its face, is also misleading. The study only looked at the rate of well installation in communities with *current* WMA permits while ignoring the vast majority of communities in the basin that have rescinded their permits but maintained outdoor water restrictions to stay under their registration limits. According to local records in towns that had or have a WMA permit, at least 2000 new wells have been installed after those permits were issued. Since the vast majority of these wells have been installed in areas served by public water systems, the only reasonable conclusion is that this rash of installations was driven largely by water restrictions.

Study Results

The DEP study conducted a reasonably good inventory of below threshold withdrawals given the lack of existing data on these classes of water withdrawals and the difficulty of estimating them. However, there are several important data gaps and the study used erroneous assumptions which resulted in a significate underestimate of the amount and impact of below threshold withdrawals summarized as follows:

- Because the state does not regulate below threshold withdrawals and municipalities generally did not require local permits for private well installations prior to the year 2000, there is almost no publicly available data on wells installed before this date. While the study tried to estimate this figure in areas outside the public water supply boundaries, it could locate only a small fraction of the actual number of wells installed prior to the year 2000. Wells have been installed for hundreds of years prior to that date throughout the watershed and there is no way to accurately determine which ones are still operational.
- For most classes of outdoor irrigation, the study assumed that all irrigators took into account the amount of natural rainfall and adjusted their irrigation accordingly, based on the need to water one inch per week. This is an odd assumption. Since only a small fraction of irrigators utilize moisture sensors (and even if they do, this technology is notoriously unreliable) or

otherwise take into account rainfall when making irrigation decisions, the study dramatically underestimates the amount of withdrawals from this largest source of below-threshold withdrawals.

- The study did not consider withdrawals from wells inside the PWS service areas (which make up the bulk of private wells installed since the year 2000) and missed some locally known large-scale withdrawals.
- The study did not take into account water leaks or other unaccounted for water use (like DEP does for regulated withdrawals).
- The study does not adequately take into account the impact of these withdrawals (which was the main intent of the petition) by not considering the timing, location and method of withdrawals.

To address these shortcomings, IRWA adjusted the DEP inventory based on more reasonable assumptions and included withdrawals missed by the DEP study within the Ipswich Basin. The adjusted amount of water use estimated by below threshold water users is, on average, roughly double that estimated by the DEP study (Tables 1&2 below). The adjusted IRWA estimates (based on the current DEP study inventory) are roughly equivalent to a similar study conducted by IRWA in 2016. Since both studies could only inventory known sources (and both studies acknowledge the existence of many potential unknown sources), and IRWA assumptions can be generally considered conservative, these overall estimates should be considered *conservative.* **As such, one could conclude, based on the adjusted study, that below threshold withdrawals are significant; growing (and will continue to grow) largely due to their exemption under the WMA; and that their impact is significant – the exact opposite of the conclusions stated by DEP in its cover letter.** This study clearly demonstrates that certain below threshold withdrawals and registrations should be regulated.

Study Adjustment Requests

Based on the above analysis, IRWA respectfully requests that the study and the DEP cover letter be amended to address IRWA's identified concerns. Specifically:

- DEP should add the withdrawals missed by the study, review and adopt more reasonable assumptions than used in the study based on expert input and then recalculate the withdrawal estimates.
- DEP should officially recognize there are many more sources that neither study could estimate due to lack of data (e.g. wells installed before the year 2000, business parks, etc.) such that water use estimates in the study are conservative.
- A reasonable unaccounted for withdrawal percentage should be added to these totals (such as the conservative 5% used by IRWA here).
- Since the DEP cover letter will likely be used as an executive summary for the public and serve as a defacto DEP policy position on below-threshold withdrawals, the DEP cover letter should be amended to address the concerns identified in this critique and the results of the re-calculations. At the very least, the cover letter should not make conclusions based on lack of data nor implications about impact without considering timing, location and method of withdrawal.
- The actual impact of these withdrawals should be reconsidered taking into account the new estimates and consideration of the location, timing and method of withdrawal as done in the case of permitted sources under the WMA program.

- In addition to the new sources identified in the DEP study for potential regulation under the WMA due to the potential use above the WMA 100,000 GPD threshold, DEP needs to add the additional sources identified by the IRWA study and investigate the need for permits for these sources as well.
- The cover letter and study documents should express estimated numbers in ranges (i.e. 5-20%) to convey the uncertainty in these estimates.

Study Implications & Conclusions

Because the adjusted study volumes exceed 4 MGD and their relative impact as compared to other withdrawals is likely higher since they consist mostly of groundwater, take place primarily during the summer season and are mostly located in level 4&5 sub-basins, the study has several implications. Specifically,

- DEP should review the regulatory threshold of 100,000 GPD (as it is mandated to do by law) and lower it in stressed basins such as the Ipswich.
- DEP needs to help find a way to reduce the impact of and de-incentivize the proliferation of below threshold withdrawals. This is especially important since the incentive to do so will only increase in the future as towns seek to stay under their permitted and registered volumes and the fact that the Safe Yield for the Ipswich River is exceeded, thereby encouraging more water users to avoid the public water systems.
- DEP should reconsider its petition decision and apply conservation measures on registrations in stressed basins such as the Ipswich.
- DEP needs to consider the below threshold withdrawal volumes in their calculation of Safe Yield and regulatory decision-making as required by the WMA.
- Because the total of registered and below-threshold withdrawals in the Ipswich basin now exceed 90% of total withdrawals, there is no way for DEP to legally meet the requirements of the WMA without conditioning registrations and bringing more of the below threshold withdrawals under the regulatory umbrella in the Ipswich Basin.

Table 1: comparison between DEP results and estimates of DEP study results adjusted by IRWA assumptions.

Table 1. Estimated Below WMA Threshold Withdrawals - Average Day				**Table 1. IRWA Revised Estimated Below WMA Threshold Withdrawals - Average Day**			
	Min (mgd)	**Average (mgd)**	**Max (mgd)**		**Min (mgd)**	**Average (mgd)**	**Max (mgd)**
Below WMA Threshold PWS Water Use (Metered data)	0.021	0.022	0.024	Below WMA Threshold PWS Water Use (Metered data)	0.021	0.022	0.024
Residential Indoor Use with Private Wells outside Municipal PWS Boundaries	0.46	0.51	0.56	Residential Indoor Use with Private Wells outside Municipal PWS Boundaries	0.648	0.720	0.792

Not Found in Mass DEP's Tables	0	0	0	Residential Indoor Use with Private Wells inside Municipal PWS Boundaries	0.170	0.189	0.208
Residential Irrigation with private wells outside Municipal PWS	0.12	0.23	0.35	Residential Irrigation with private wells outside Municipal PWS	0.240	0.460	0.460
Residential Irrigation with private wells inside Municipal PWS	0.27	0.54	0.81	Residential Irrigation with private wells inside Municipal PWS	0.540	1.080	1.080
Below WMA Threshold Course Irrigation	0.23	0.307	0.384	Below WMA Threshold Golf Course Irrigation	0.230	0.307	0.384
Below WMA Threshold Agricultural Water	0.27	0.5	0.74	Below WMA Threshold Agricultural Water	0.616	0.850	1.084
Playing Field Irrigation outside of Municipal PWS	0.026	0.051	0.077	Playing Field Irrigation outside of Municipal PWS	0.105	0.132	0.132
Playing Field Irrigation inside of Municipal PWS	0.037	0.074	0.111	Playing Field Irrigation inside of Municipal PWS	0.147	0.184	0.184
Car Washes with Private Wells	0.005	0.005	0.006	Car Washes with Private Wells	0.005	0.005	0.006
Concrete Batching with Private Wells	0.056	0.084	0.112	Concrete Batching with Private Wells	0.156	0.184	0.212
Not Found in Mass DEP's Tables	0	0	0	Commercial Withdrawals (including Pool Filling Companies & Business Parks)	0.124	0.138	0.138
Sub Total	**1.494**	**2.323**	**3.173**	**Sub Total**	**3.002**	**4.271**	**4.703**
Add 5% unaccounted for use					0.150	0.213	0.235
Total	**1.494**	**2.323**	**3.173**	**Total**	**3.152**	**4.484**	**4.938**

Table 2: Comparison between DEP Study and IRWA Critique Assumptions

S/N	Categories	DEP Study's Assumptions	IRWA's Critique Assumptions

1	Below WMA Threshold PWS Water Use (Metered data)	• Average Residential per capita use was assumed as 55 residential gallons per capita day (RGPCD).	• Average Residential per capita use was assumed as 65 residential gallons per capita day (RGPCD)[1].
		• Average household size assumed 2010 Federal Census figures per community	• Same
		• Assumed that PWS's that reports 100% service area provide domestic demand to 100% of the community	• Adjusted by known wells in PWS service areas
		• Assumed every developed residential parcel falling within areas outside PWS boundaries has a private well for indoor use.	• same
2	Residential Indoor Use with Private Wells outside Municipal PWS Boundaries	• Min and Max values are assumed to be 10% less than/greater than the average value and based on 55 Residential Gallons per Capita Day (RGPCD).	• Same except based on 65 Residential Gallons per Capita Day (RGPCD).
		• Average Day and August Average Day are assumed to be the same	• Same
3	Residential Indoor Use with Private Wells inside Municipal PWS Boundaries	• None (assumed no inside use inside PWS boundaries)	• Min and Max values are also assumed to be 10% less than/greater than the average value which is based on 65 Residential Gallons per Capita Day (RGPCD).
			• Average Day and August Average Day are assumed to be the same.
			• Annual Withdrawal = Average Day Demand x 365 days.
4		• Growing season is assumed to be May 1 through September 30 (153 days) and the seasonal total is assumed to be equivalent to annual total.	• Same
		• Watering application rate was assumed to be 1-inch of water per week for lawns to be delivered through a combination of irrigation and natural precipitation.	• Watering application rate was assumed to be 1-inch of water per week for lawns and 20% of irrigators adjust their watering rate to account for rainfall.
		• Residential irrigation of lawns	• Residential irrigation of lawns

[1] Based on the assumption that suburban water users not subject to water restrictions generally have a higher rgcpd. 65 is the standard for residential water consumption as provided by the Massachusetts Water Conservation Standards – See Page 5. https://www.mass.gov/files/ma-water-conservation-standards-draft-2-5-18.pdf

		was assumed to range between 0.2 to 0.6 inches per week for the majority of the season, with the remainder of the water needed to reach the 1-inch rate assumed to be obtained from precipitation.	was assumed to range between 0.8 inches and 1 inch per week for the majority of the season, with the remainder of the water needed to reach the 1-inch rate assumed to be obtained from precipitation.
5	Residential Irrigation with private wells inside Municipal PWS	• Growing season is assumed to be May 1 through September 30 (153 days) and the seasonal total is assumed to be equivalent to annual total.	• Same
		• Watering application rate was assumed to be 1-inch of water per week for lawns to be delivered through a combination of irrigation and natural precipitation.	• Watering application rate was assumed to be 1-inch of water per week for lawns and 20% of irrigators adjust their watering application rate to account for rainfall.
		• Residential irrigation of lawns was assumed to range between 0.2 to 0.6 inches per week for the majority of the season, with the remainder of the water needed to reach the 1-inch rate assumed to be obtained from precipitation.	• Residential irrigation of lawns was assumed to range between 0.8 inches and 1 inch per week for the majority of the season, with the remainder of the water needed to reach the 1-inch rate assumed to be obtained from precipitation.
		• Residential irrigation withdrawal was estimated to be greater inside PWS boundaries than outside of the boundaries on the basis that majority of the areas outside of the PWS boundaries are low development density areas with less irrigated lawns.	• Same
6	Below WMA Threshold Golf Course Irrigation	• Min and Max assumed to be 25% less than /greater than the average value.	• Same
		• Seasonal total is based on peak period irrigation of 13 weeks (92 days) and is considered equivalent to the annual total.	• Same
7	Below WMA Threshold Agricultural Water	• Average day livestock water use minimum was assumed to be 90% of the Average and the maximum was assumed to be 110% of the Average.	• Same
		• For Annual Withdrawal, the	• Same

		assumption was daily irrigation throughout the growing season (153 days, May – September) and daily livestock water use for the entire year (365 days).	
		• The entire water withdrawal for Marini Farm was assumed to be from the Parker Basin because Marini Farms' home farm is within the Parker Basin.	The vast majority of land farmed by Marini is on leased land in the Ipswich Basin and the majority of that land is used to grow sweet corn a high water use crop. Use estimates from former employee familiar with Marini irrigation systems & practices.
		Richardson's Dairy Farm in Middleton does not irrigate crop land	Richardson's grows a large amount of feed corn. Watering estimate based on Marini rates adjusted by lower requirements for feed corn.
		• <u>Agricultural Irrigation Water Use – Christmas Tree Farms</u>: It was assumed that only 30% of production area (new plantings) is irrigated and rate was estimated to be between 0.2 - 0.6 inches per week.	• Same
		• <u>Agricultural Irrigation Water Use – Nurseries and Greenhouses:</u> assumed that only 80% of the total greenhouse area is watered and rates were assumed to be between 0.2 – 0.3gpd/sq. ft. Outdoor stock irrigation rates were assumed to be between 1.7 – 2.4 inches per week.	• Same
		• <u>Agricultural Irrigation Water Use - Orchards:</u> A assumed that the orchards used drip irrigation with irrigation rates of between 0.2 – 0.6 inches per week.	• Same
		• <u>Agricultural Irrigation Water Use - Crops:</u> Irrigation rates were assumed to be between 0.2 – 0.6 inches per week. Corn fields and mazes were assumed to be watered at this irrigation rate while hayfields and grazing pastures were assumed not to be irrigated at all.	• Same, with the exception of Richardson and Marini Farms

		• Agricultural Livestock/Dairy Water Use: Average day livestock water use minimum and maximum were assumed to be 90% and 110% of the Average respectively.	• Same
		• For the calculation of annual withdrawals, the duration of all Agricultural Irrigation was assumed to be daily throughout the growing season (153 days, May – September) and for livestock, daily water use for the entire year (365 days).	• Same
8	Playing Field Irrigation outside of Municipal PWS	• Watering application rate was assumed to be 1-inch of water per week for lawns to be delivered through a combination of irrigation and natural precipitation.	• Watering application rate was assumed to be 1-inch of water per week for lawns and 20% of irrigators adjust their watering rate to account for rainfall.
		Topsfield Road athletic fields in Boxford not included	Assumed use same as Keith R. Koster Park in Boxford
9	Playing Field Irrigation inside of Municipal PWS	• Estimates provided for fields with known private wells in DEP database or identified in IRWA 2016 report as having private well.	• Same except above IRWA method used to estimate use
		• All other playing fields within the municipal PWS boundaries within the study area were assumed to receive irrigation water from a municipal PWS.	• Same except above method used to estimate use
10	Car Washes with Private Wells	• MassDEP's Data was based on the assumption that Minit Car Wash within the Ipswich River Basin uses the well associated with its property for operations as there was no evidence to the contrary.	• Same
		• Water use estimate was determined by using the data for a similar type and size of car wash with metered private well water use.	• Same
11	Concrete Batching with Private Wells	• Assumptions determined by the size of the facilities; small facilities assumed at 8-16 trucks per day and for large facilities assumed at 10-20 trucks per day.	• Same, with the exception of Benevento Gravel Company which also has a bulk water delivery business, truck washing facility and operation-wide dust control irrigation system
12	Other Commercial	None	• Same except two large water

	(e.g. Business Parks)		delivery operations using same source in Middleton added based on withdrawals 5 days per wk. for a period of 12 weeks.

Appendix: IRWA Calculations Spreadsheet

Table 5-1: Below WMA Threshold PWS Withdrawal, Summary of 2016 Reported Data
Table 5-2: Below WMA Threshold PWS Withdrawal, Average Day Demand (2014 - 2016)
Table 5-3: Below WMA Threshold PWS Withdrawals, Aug. Average Day Demand (2014 -2016)
Table 5-4: Total Summary of Below WMA Threshold PWS Withdrawals in Ipswich Basin based on 2014-2016 Data
Table 5-5A: Estimated Residential Withdrawals for Indoor Use outside Municipal PWS Boundaries (Mass DEP)
Table 5-6A: Summary of Residential Withdrawals for Indoor Use outside Municipal PWS Boundaries by Basin
Table 5-5B: Estimated Residential Withdrawals for Indoor Use inside Municipal PWS Boundaries (Mass DEP)
Table 5-6B: Summary of Residential Withdrawals for Indoor Use inside Municipal PWS Boundaries by Basin
Table 5-7: Summary of Average Weekly Precipitation Data, May – September
Table 5-8: Summary of Residential Irrigation Water Withdrawals outside of Municipal PWS Boundaries
Table 5-9: Summary of Residential Irrigation Water Withdrawals inside of Municipal PWS Boundaries
Table 5-10: Below WMA Threshold Golf Course Irrigation Water Withdrawal
Table 5-11: Summary of Below WMA Threshold Golf Course Irrigation Water Withdrawal
Table 5-12: Agriculture Irrigation Estimated Water Withdrawal with Private Supply
Table 5-13: Livestock Water Use with Private Supply
Table 5-14: Summary of Agriculture Irrigation and Livestock Water Withdrawals
Table 5-15: Concrete Batching Water Withdrawals with Private Supply
Table 5-16: Summary of Concrete Batching Water Withdrawals
Table 5-17: Car Wash Water Use with Private Supply as compared with Similar Operations with metered PWS Supply
Table 5-18: Summary of Car Wash Water Withdrawal with Private Supply
Table 5-19: Playing Field Estimated Water Withdrawals with Irrigation-only Supply
Table 5-20: Summary of Playing Field Water Withdrawals with Irrigation-only Supply
IRWA Table 1: Commercial Withdrawals (Pool Filling Companies & Business Parks)
IRWA Table 2: Summary of Commercial Withdrawals
Table 5-21: Estimated Below WMA Threshold Withdrawals – Average Day
Table 5-22: Estimated Below WMA Threshold Withdrawals – August Average Day
Table 5-23: Estimated Below WMA Threshold Withdrawals – Annual
IRWA Table 3: Water Leaks
IRWA Table 4: Summary of Private Wells in Ipswich Basin & WMA Authorization status within the Ipswich Study Area