COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
OFFICE OF ADMINISTRATIVE APPEALS

In the Matter of Town of Topsfield	Docket No. 2003-079 File No. 9P-3-17-298.01 Topsfield
In the Matter of Town of Wenham	Docket No. 2003-068 File No. 9P2-3-17-320.01 Wenham

INTEVENORS' POST-HEARING MEMORANDUM

I. PROCEDURAL BACKGROUND

A consolidated adjudicatory hearing was held in the above Matters of Town of Topsfield and Town Wenham (collectively, the Towns) before Magistrate James Rooney on June 14-16 and 18, 2004. The crux of the Intervenors' claims are that the Department authorized water withdrawals that cumulatively exceed the safe yield of the water source, failed to impose sufficiently stringent conditions on the permit holders and that the Department's modifications to the Towns' Water Management Act permits (modified permits) were arbitrary and capricious, an abuse of discretion, illegal or otherwise not in accordance with law. The primary remedy that the Intervenors are seeking is a provision in each of the Towns' modified permits that they develop and implement a water banking program forthwith to offset new or increased water use resulting from development, redevelopment or expansion projects. In addition, Intervenors seek higher streamflow triggers to initiate water restrictions sooner, a meaningful Special Condition 11 water conservation program and leak detection every two years (Wenham).

The Intervenors assert that the Towns' modified permits alone and in combination with the other modified permits in the Ipswich River basin: exceed the safe yield of the water source; fail to achieve a balance among competing water withdrawals and uses; fail to preserve the water resource itself; fail to minimize the impact of water withdrawals on, or to protect, water quality, navigation, water-based recreation, wetland habitat and fish and wildlife; and violate anti-degradation provisions of the Massachusetts Surface Water Quality Standards.[1] See Motions to Intervene in Matters of Town of Wenham and Town of Tospfield; Intervenors' Prehearing Conference Memoranda; Prehearing Conference Reports.

The safe yield issue, which was listed as an issue in all of the Ipswich modified permit appeal cases, was originally framed as "What is the safe yield of the Ipswich River?" In a Conference Report applicable to all the appeals, dated January 13, 2004, Magistrate Rooney rephrased the issue as:

> Should additional conditions (or a reduction in allocation) be imposed in the modified permits, beyond those conditions imposed by the Department, to meet the requirements of the Water Management Act and its implementing regulations? See M.G.L. c 21G and 310 CMR 36.00.
>
> a. Was information available to the Department at the time of the permit modifications that should have led it to recalculate the safe yield? See 310 CMR 36.33(4).
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> b. If so, what did the available information show about how it should be recalculated?
>
> c. If the available information shows that the safe yield would have been less than the safe yield originally calculated by the Department, what consequences should follow to the modified permits?

[1] Magistrate Rooney summarized the Intervenors' other claims in the Towns' Prehearing Conference Reports, as "Should any additional conditions be imposed in the permit, beyond those imposed by the Department, to meet the requirements of the Water Management Act and its implementing regulations?" All of these grounds support the Intervenors' argument that a water banking program that takes effect now is necessary.

1) Are the conditions imposed by the Department adequate to meet its obligations under 310 CMR 36.28(j) or must additional conditions (including some or all of those proposed by Intevenor in its appeal or its prehearing conference memorandum) be imposed or the allocations reduced?

As Magistrate Rooney recognized in his "Ruling on Issues to be Adjudicated: Safe Yield," dated April 2, 2004:

> [Intervenor's] purpose in raising safe yield is to bolster its contention that DEP failed to include conditions adequate to limit overall water usage by the permit holders and to demonstrate a basis for imposing more stringent conditions or changing the amount allocated.

In fact, Intervenors contend the modified permits explicitly authorize water withdrawals that exceed the safe yield of the water source in violation of the WMA and regulations, and that the allocations must be reduced, and/or a water bank required now to comply with the statutory scheme. While the Intervenors have not been seeking a remand to the Department to recalculate the safe yield in this proceeding[2] this does not change the issue of whether Wenham's and Topsfield's permits singly and in combination with the other WMA permits in the Ipswich basin are arbitrary and capricious, an abuse of discretion, illegal or otherwise not in accordance with law and whether the Department should be required to impose a water bank provision that become effective now.

Intervenors contend that a number of more stringent conditions must be imposed where the credible evidence clearly shows (and the Department admits) that the basin is

[2] The Intervenors have always claimed that the Department is legally required to re-determine the safe yield and they have never waived their claim that the withdrawal allocations must be reduced because the safe yield has been exceeded. The pragmatic reason the Intervenors have not advocated a remand to the Department is because the delay and near certain administrative appeals by the permit holders of the Department's decision would result in these modified permits not taking effect for several more years, and quite possibly, not before they expire in 2009. Assuming that the Magistrate determines that implementation of water banking now must be a condition of the Towns' permits, this does not obviate the Department's obligation to re-determine the safe yield of the basin. And, of course, the Magistrate could decide that a remand to the Department for a determination of safe yield is the appropriate remedy, instead of requiring water banking now.

over-allocated for water withdrawals, that the Department no longer believes its prior safe yield determination is accurate, the allocations in the modified permits will continue to result in the safe yield of the basin being exceeded, the permit provisions fail to protect the interests of the WMA, and where significant damage to the environment will continue amd potentially worsen.

II. BURDEN OF PROOF

Magistrate Rooney requested that the parties address the burden of proof in these proceedings. *In the Matter of Town of Freetown*, Dkt. No. 91-103, Recommended Final Decision, February 14, 2001, a case involving the WMA, the Administrative Law Judge noted that "the Department has consistently placed the burden of going forward in permit appeals on the parties opposing the Department's position. See 310 CMR 1.01(13)(c)1.[6]." Under the Wetlands Regulations, the burden of going forward means "having to produce at least some credible evidence from a competent source in support of the position taken." 310 CMR 10.03(2); *John Marshall*, Dkt. No. 85-37, Decision on Motion for Reconsideration, October 3, 1988.

The Towns bear the ultimate burden of proof in these proceedings. *Cf*, *Jan Companies, Inc*., Dkt. No. 97-069, Ruling on Petitioner's Motion Regarding Burdens of Going Forward, March 26, 1998. However, Intervenors bear the burden of going forward on their issues, as do the Towns. Having met its burden of going forward and burden of proof on the safe yield issue and failure to minimize the impact of the permitted withdrawals on, or to protect, water quality, navigation, water-based recreation, wetland habitat and fish and wildlife, the burden shifted to the Department (and the Towns) to rebut these issues. *Douglas Abdelnour and Bonnie Abdelnour*, Dkt. No. 88-138, Final

Decision, November 22, 1994 at fn 36. The standard of proof is by a preponderance of the evidence.

III. STATEMENT OF FACTS

Kerry Mackin's testimony and supporting exhibits, as well as the Department's direct and rebuttal testimony and exhibits, and the cross-examination testimony of Thomas Lamonte established that the USGS studies conclusively show that water withdrawals are a major cause of the reduced Ipswich River flows;[3] that the Ipswich River's biological, physical and chemical integrity have been impaired by the loss of flow; that Ipswich River fisheries have been devastated by the extreme low and no-flow conditions; that the Aquatic Habitat Study (Intervenors' Exhibit 6) by USGS-MA Division of Fish and Wildlife[4] concluded that summer flows between 0.42 to 0.49 cubic feet per second per square mile (cfsm), or at least double the minimum streamflow value adopted by the Water Resources Commission (WRC) in the early 1990's, are necessary; and that the Fisheries Restoration Task Group, comprised of fisheries experts and in which the Department actively participated, recommended seasonal streamflows of 0.49 cfsm (June-October) and higher streamflows throughout the rest of the year.[5] The Department agrees (and the Towns' did not contest at the hearing) that the USGS studies

[3] USGS in its report, *A Precipitation-Runoff Model for Analysis of the Effects of Water Withdrawals on Streamflow, Ipswich River Basin, Massachusetts*, (USGS 2000) ("Hydrological Model"), concluded that "Water withdrawals from the 155-square mile Ipswich River Basin in northeastern Massachusetts affect aquatic habitat, water quality and recreational use of the river [and that] . . . cumulative ground-water withdrawals substantially decrease low flows." Standard Exhibit 10 at p. 1.

[4] *Assessment of Habitat, Fish Communities, and Streamflow Requirements for Habitat Protection, Ipswich River, Massachusetts, 1998-99* ("Aquatic Habitat Study").

[5] The Statement of Facts primarily concerns the safe yield issue, however, the facts and subsequent argument apply equally to the Intervenors' other claims. Additional facts -- testimony and exhibits -- are discussed as relevant in other sections of this memorandum. References to the Hearing Transcript will be cited as Tr. 1/__, etc., according to volume and page.

and Fisheries Restoration are "the best available science." (LeVangie and Lamonte cross-examination).

The sole prefiled direct testimony presented by the Department on the issue of safe yield was from Mr. LeVangie, who stated that the Department did not re-evaluate safe yield during the five-year review because no new reference streamflow was developed and approved by the WRC and "implementation of the required conditions [will] likely result in actual water use reductions." (LeVangie direct and rebuttal testimony, p. 11).[6] Neither he nor any other witness refuted the Department's admissions that while it originally determined in the early 1990's that there was an additional 3.5 mgd of water to allocate in the Ipswich basin above the registered volumes,[7] the Department now knows that this number was incorrect and that the Department has no confidence in its previous safe yield determination.[8] (Mackin direct testimony at p. 9-10; Intervenors Exhibit 15). LeVangie agreed that based on Neil Fennessey's computations for the Department using the methodology in 310 CMR 36.31(2) (which he had no reason to doubt) any streamflow value over .25 cfsm results in a determination of "zero" water to allocate above the total registered volumes in the Ipswich basin. (Tr. 3/174-175; 3/217; Mackin direct testimony and Intervenors exhibit 17).

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[6] Five months prior to issuing the modified permits during the five-year review, the Department in a letter from the Commissioner committed to re-determining the safe yield of the Ipswich River basin using the new studies and information that had been developed. (Intervenors' Exhibit 23).

[7] As well as 8 mgd for "flood-skimming" by the surface water diverters.

[8] On cross Mr. LeVangie stated without explication that he was not sure he would describe it as "lost confidence." (Tr. 3/175). He admitted that the Department did look at the consequences of using .42 cfsm in the safe yield methodology in 310 CMR 36.31(2) ("the methodology") and that he knew that the result would be "significantly less than the amount allocated." Tr. 3/167-169. LeVangie agreed that based on Neil Fennessey's computations (which he had no reason to doubt) for the Department using the methodology any streamflow value over .25 cfsm results in a determination of "zero" water to allocate above the total registered volumes in the Ipswich basin. Tr. 3/174-175; 3/217.

The Department admits that the Ipswich River's capacity to supply water resources has been exceeded and that it has experienced "unsustainable patterns with significant low-flow problems," and variously characterizes it as "very oversubscribed," "over-allocated," "one of the most hydrologically stressed basins in Massachusetts," and "heavily impacted by groundwater withdrawals." (Mackin direct testimony at p. 16; Intervenors Exhibit 23; Lamonte direct and rebuttal testimony, Exhibit A p. 1; Tr. 3/141; 4/120-123). "Oversubscribed" according to Mr. Lamonte means that off-stream uses (*i.e.*, water supply) have exceeded the carrying capacity of the river. Tr. 4/123.

In Mr. Lamonte's opinion, Ipswich River withdrawal impacts and low flows are increasing: for example, record low flows were recorded at the South Middleton dam in the 2002 summer and flows through the course of the 1990's were repeatedly very low (Tr. 4/101, 108-109). Although many communities, including Wenham and Topsfield, are using less water than they are authorized to withdraw, even so under current conditions, portions of the upper Ipswich River dry up completely and the whole river regularly experiences severe low flows. (Lamonte and LeVangie cross). Mr. Lamonte agreed on cross that if Wenham and Topsfield and the other permit holders were to withdraw their full authorized volumes, conditions in the Ipswich River would be worse than they are today. (Tr. 4/94).

While agreeing that the concept of safe yield is pivotal to the WMA and that there are numerous references to it in the regulations (Tr. 3/177-78), Mr. LeVangie, was unable to say what safe yield means in the WMA and regulations. (Tr. 3/177-178; 179). Asked how the Department has considered safe yield in the past, Mr. LeVangie responded, "the concept of safe yield and minimum streamflow had been stopped in the early '90s with

the basin plan implementation because of legitimate concerns by a number of parties." Tr. 3/208. [9] Summing it up, Mr. LeVangie testified, "You know, it's 12 years and we haven't identified what safe yield is and minimum streamflow." (Tr. 3/210).

Mr. LeVangie couldn't really answer whether the modified permits will ensure that the safe yield of the Ipswich basin is not exceeded, stating, "I have no idea what a minimum streamflow – of [sic] some of the other numbers that would go into determining what the safe yield number is going to be. So I'm not sure I can really answer that question." (Tr. 3/219). He agreed that safe yield is intended to be a limit, or bottom line, on the amount of water that can be removed from a basin, or water source, and that the Department may not issue permits that cumulatively will exceed the safe yield of the basin. (Tr. 3/180-81).

The Department used the WRC's reference streamflow value of 0.22 (or 0.217) 1 cfsm in its original determination that 3.29 mgd was available for allocation using the safe yield methodology at 310 CMR 36.31(2). (Mackin direct testimony at p. 11). On cross examination, Mr. Lamonte explained that while this reference streamflow had been intended to provide reasonable protection of fisheries and other interests, Vicki Gartland, who developed the original .22 cfsm reference streamflow[10] and was very involved in the new USGS studies, now agrees that the old 0.22 cfsm minimum streamflow value is

[9] While Levangie testified that he considered the Ipswich River Basin Plan by the then Department of Environmental Management to be a "credible study," (Tr. 3/149) he admitted that the plan was never updated (at least every five years) as required and that shortly after it was issued, the basin planning process was discontinued. (LeVangie cross). As Mr. Lamonte explained, the basin plans are obsolete: faulty assumptions and considerations went into the basin planning effort and it was discontinued in the early '90's shortly after it began. (Tr. 4/116; 125-126). Only seven to nine of the 27 river basin plans were ever done and the regulations that required the WRC to develop basin plans, 313 CMR 2.00, were repealed in 1996. (Tr. 3/201).

[10] Ms. Gartland was the author of the Ipswich River Basin Plan and the 0.21 cfsm reference streamflow adopted by the WRC was taken directly from the Basin Plan. (Kerry Mackin direct testimony and exhibit 12; Tr. 4/126).

inadequate for ecological integrity and that a streamflow of at least 0.42 cfsm is needed to provide reasonable protection of these interests.[11] (Tr. 4/114-115). Lamonte knows of no credible evidence today that would support a 0.22 cfsm minimum streamflow value for ecological integrity in the Ipswich River. (Tr. 4/115). In fact the whole concept of a single minimum streamflow has been rejected as not scientifically supportable. (Tr. 4/117-119; Mackin direct and exhibit 12, 13, 14).

Mr. Lamonte testified that the Department adopted 0.42 cfsm as a reasonable level for aquatic habitat protection in the summer months for the Ipswich River and higher streamflows for other times of the year. Tr. 4/113-114, 119). In 2003, the Department was coordinating with the WRC and the Department of Environmental Management (DEM), now DCR to establish new streamflow values for the Ipswich basin and it was expected, based on discussions with them, that the WRC and DEM would support these streamflow thresholds. (Tr. 4/120; Lamonte exhibit B).[12]

The Department assured counsel for the Ipswich River Watershed Association in December 2002 in a letter signed by the Commissioner that "We will use the information and studies that have recently been developed in re-determining the safe yield of the Ipswich River Basin and to ensure that the purposes of the Water Management Act, including protection of the water resource itself, are being met." (Intervenors' exhibit 23). To date, the Department has not re-determined the basin's safe yield. (Tr. 3/158).

Lamonte agreed that it is the Department, not the WRC, which makes the determination of safe yield of a water source, and that if the Department revised permits

[11] DCR was a cooperator with DEP on its WMA permitting strategy for the Ipswich basin and Lamonte discussed the new information and strategy frequently with Vicki Gartland, DCR's hydrologist and staff to the WRC.

[12] Mr. Lamonte testified that "the 0.42 cfsm would be of high consideration for the WRC . . ." (Tr. 4/125).

based on a new safe yield determination, it would not change just one permit. It would make sense to do this when the Department was looking at all the permits together, or cumulatively. (Tr. 4/132, 137). This recent five-year review by the Department afforded exactly this opportunity.[13]

Mr. Lamonte admitted that the Department had no target for water reduction when it put together the performance standards and no particular goal for water savings in the modified permits. (Tr. 4/148-149). He agreed with Nigel Pickering, the Intervenors' expert, that the seasonal cap will only result in a 3% savings on average and 8.5% in a dry year and that this will fall far short of making up the summertime deficit in the Ipswich basin identified in the *Ipswich River Watershed Management Plan*. (Tr. 4/ 150-151; Intervenor exhibit 29; Lamonte exhibit D).[14] Because some measures interact and have a shared effect, for instance, the seasonal cap and the 65-gallon per capita day performance standard, and mandatory outside watering restrictions are difficult to quantify, actual water savings are hard to project. (Tr. 4/151-153, 168).

IV. ARGUMENT

A. The Modified Permits Authorize Water Withdrawals that Exceed the Safe Yield of the Ipswich River Basin in Violation of the WMA and Regulations.

The WMA and its regulations prohibit the Department from permitting water withdrawals that exceed the safe yield of the "water source," defined in the regulations at

[13] It is not clear whether the Department will conduct the last required five year review before the permits expire in 2009. It sought the opinion of the permit holders on this in the Orders to Complete.

[14] The Management Plan funded by EOEA estimates the water deficit for the entire Ipswich River watershed as 14.4 mgd for the summer months (July-September). The Management Plan establishes a goal of 5.4 mgd in summer water conservation savings for the entire watershed. Mr. Lamonte agreed that the basin-wide savings from the seasonal cap provision will be 3.4 mgd in a dry year and much less in a normal year (0.53 mgd), far below the necessary savings identified in the Management Plan.

310 CMR 36.03 to include river basins.[15] Safe yield is the limit on the amount of water that the Department has the authority to allocate to ensure that the individual and cumulative withdrawals from a water source are "dependable" or "sustainable" even during an extreme drought. This is determined based on the amount of streamflow that is available during a severe drought, minus the amount that must remain in the river to support instream interests.

As Judge Rooney recognized in his April 2, 2004 ruling, "Safe yield plays an important role in the process by which DEP permits water withdrawals under the Water Management Act Regulations. The Regulations are replete with references to DEP's obligation to ensure that withdrawals from the water source do not exceed the safe yield of the water source."

Despite the central role of safe yield in the WMA permit process, the Department acknowledged that it did not redetermine safe yield, but instead relied on conservation measures to achieve reductions in water usage. It did not identify an overall quantitative goal for reductions in water use that must be achieved under the modified permits. (Tr. 4/148-149). Rather it took a trial and error approach, while continuing to authorize total withdrawals that exceed the river basin's capacity. Mr. Lamonte agreed that the Department's approach was to "have the conditions in play and then to examine the results in terms of streamflows and reductions in uses over a period of time." (Tr. 4/202). While the conservation measures are a good idea (and clearly authorized in the regulatory

[15] Section 2 of the WMA defines "safe yield" as "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 periods of greatest water deficiency is likely to occur, provided, however, that such dependability is relative and is a function of storage and drought probability." The regulations at 310 CMR 36.03 define safe yield as "the maximum annually averaged daily water use consumptive loss rate that can be sustained from a water source with an acceptable degree of risk."

scheme) they cannot substitute for the Department's obligation to ensure that withdrawals do not exceed safe yield.

A wealth of information was available to the Department at the time it conducted the five-year review of the Ipswich basin WMA permits that made it clear that the withdrawals authorized by the Department exceeded the safe yield of the basin. These included: the recent USGS studies establishing that water withdrawals cause unnaturally low flows that result in lost and degraded habitat; the USGS recommended seasonal streamflow for aquatic habitat, which is double the old DEM minimum streamflow value for the Ipswich; actual experience with the results of the water withdrawals -- massive fish kills, streambank exposure, segmentation at riffles and dry riverbed conditions; water quality impairment, such as low dissolved oxygen, streamflow gage data, fish community data and a Target Fish Assessment that showed a paucity of flow-dependent species in the current fish community. All of this information proved that the basin is over-allocated for water withdrawals and that the safe yield of the basin has been exceeded.

In fact, the Department admitted that it had lost confidence it is original safe yield determination and that its determination of 3.29-3.5 mgd of water to allocate in the Ipswich basin over and above the registered volumes was incorrect. The Department has on a number of occasions referred to the Ipswich river basin as over-allocated and over-subscribed: its Ipswich WMA Permitting Strategy document (Lamonte exhibit A) states that "we have reached, and exceed, the capacity of the river to supply the water resources on which the region depends for economic stability and growth. Until recently we did not have the data and analysis that could tell us by how much the River is oversubscribed or what could be done to restore a balance of uses on the river." Mr. Lamonte testified

the river has not been sustainable for habitat for a long time. (Tr. 4/123).[16]

The information that the Department had in hand at the time of the five-year review should have led it to recalculate the safe yield of the basin.[17] The Commissioner confirmed this when she wrote, "We will use the information and studies that have recently been developed in re-determining the safe yield of the Ipswich River Basin . . . " (Intervenors exhibit 23).

The language in 310 CMR 36.28(1)(j) provides that the Department shall not issue permits that exceed the safe yield of the water source: "All permits shall be conditioned on at least the following: . . . that the withdrawal in combination with other registered and permitted withdrawals shall not exceed the safe yield of the water source." (emphasis added). This requirement that water withdrawals not exceed the safe yield of the water source is not discretionary. Safe yield is especially important to implementation of the WMA because its sets a finite limit on the amount of water that can be withdrawn from a water source, while protecting the interests set forth in the WMA.[18] Notably, there is no exception: the Department may not authorize water withdrawals in excess of the safe yield. See, G.L. c. 21G, § 11; 310 CMR 36.30(2)(a).

Under the plain language of the regulations, the Department has a mandatory affirmative duty to condition permits so that the safe yield is not exceeded. In fact, Mr. LeVangie in his direct testimony relies on criteria in 310 CMR 36.28(1) as a basis for

[16] In the Department's Post Hearing Brief in the Matter of Town of Wilmington, Dkt. No. 2003-074, the Department opines at p. 8 that "By the time the 5-year review of Permits in the basin was due, there was no dispute that the Ipswich River was highly stressed and that some combination of reduced allocation augmented by the recovery of additional volume through conservation was warranted."

[17] With respect to groundwater withdrawals the Department has had all the information that it needs since 2002. (Tr. 4/111).

[18] See G.L. c. 21G, §§ 3, 7.

other conditions imposed by the Department in the modified permits.[19] See LeVangie direct and rebuttal testimony at p. 3 and 6. Significantly, the Department also agreed in its Post Hearing Brief in the Matter of Town of Wilmington, pg. 8 fn 6, on the applicability of 310 CMR 36.28 in these proceedings, explaining that this regulation "prescribes certain additional considerations pertaining to the permit conditions . . . [and] sets forth mandatory minimum conditions."

While 310 CMR 36.33(4) specifies that the Department "will review . . . any available safe yield information," it is not free to ignore highly relevant information regarding this pivotal issue or to issue modified permits that exceed the safe yield. Mr. Levangie testified that the reason the Department did not re-evaluate safe yield at the time it modified these permits was because there was no new reference streamflow by the WRC and the required conditions will "likely result in actual water use reductions."[20] LeVangie direct at p. 11.

The Department is less than forthright on this issue: its claim that its did not re-evaluate basin safe yield because the WRC had not changed the reference streamflow, cannot withstand scrutiny for several reasons. First, nothing prevents the Department from using an accurate streamflow number in place of the WRC reference streamflow in

[19] The regulations at 310 CMR 36.28(1) also require the Department to condition permits to minimize the impacts of the withdrawal on water quality, navigation, water-based recreation, wetland habitat, and fish and wildlife and conditions necessary to further the purposes of the Act and assure compliance with the implementing regulations.

[20] No Department witness testified that the water conservation provisions in the modified permits were premised in any way on meeting safe yield. In fact, Mr. Lamonte testified that the Department did not have a water reduction target in devising the performance standards nor a particular water savings goal in the modified permits. (Tr. 4/148-149). He agreed that actual water savings are hard to project because the provisions overlap. (Tr. 4/152-153; see also 2/146, 3/200). LeVangie's assertion that the overall volumes were reduced in the modified permits is without relevance since the evidence showed that the safe yield is exceeded at combined withdrawal volumes below these allocations -- allocations that are not currently being withdrawn.

the 310 CMR 36.31(2) methodology. The regulations at 36.31(2) specify how, in "water sources deemed appropriate by the Department," it is to determine the safe yield of a water source. As explained by Ms. Mackin in her direct testimony, the only variable in the calculation is the streamflow value. It is abundantly clear from the evidence presented that the 0.22 cfsm WRC reference streamflow value is not scientifically valid and will not prevent "an adverse environmental impact on the water resources of the basin," as originally believed. Intervenors Exhibit 12 at p. 33.

The Fisheries Task Group, relying largely on the extensive Ipswich River habitat assessment work by USGS and MA DFW, recommends a flow of 0.49 cfsm from June-October, or more than twice the old DEM minimum summertime streamflow, and higher thresholds for other months.[21] None of the four methodologies utilized by USGS and MA DFW in their habitat assessment work supports a seasonal minimum streamflow of 0.22 cfsm and Mr. Lamonte testified that there is no credible evidence that supports the WRC reference streamflow value as adequate for ecological integrity in the Ipswich basin. The Department adopted the 0.42 cfsm seasonal streamflow value as the best available science on adequate streamflow for aquatic habitat in the Ipswich River, and DCR's representative, who had originally devised the minimum streamflow value adopted by the WRC, agrees with the 0.42 cfsm streamflow threshold and now believes the 0.22 cfsm value is inadequate.

The Department is certainly free to use a streamflow value in its safe yield determination that new science establishes is more credible. In fact, 310 CMR

[21] The Towns' modified permits do not require any restrictions based on streamflow thresholds in the period November through April. In fact, the streamflow triggers for restrictions in May are far below both the Fisheries Task Group's recommended March through May streamflow of 2.5 cfsm, and the 1.0 cfsm interim streamflow set by the Department for surface water diversions from March through May.

36.31(1)(e) specifies that in any determination of safe yield the Department may consider "any additional applicable information."[22] The Department has the authority, and Intervenors contend, the obligation, to use a more accurate streamflow value when it has clear evidence that the WRC reference streamflow value is not scientifically supportable.

Second, even if the Department determines that it is "not appropriate" to use the methodology in 36.31(2) because the reference streamflow value has not been changed by the WRC, this does not obviate the Department's responsibility under 36.28(1)(j) and 36.33(4). Subsection (1) of 310 CMR 36.31 specifies the criteria that the Department may consider at a minimum in its determination of safe yield. Reading 36.31 (1) and (2) together makes it clear that subsection (1) is the default provision on safe yield in situations where the Department finds the use of subsection (2) inappropriate.

Lastly, the Department's failure to come to grips with and to implement the "pivotal concept" of safe yield for the past 12 years cannot be excused by the WRC 's failure to change the reference streamflow.[23] Mr. LeVangie's testimony on cross makes clear that the Department stopped following the regulations on safe yield in 36.31(1) and (2) over a decade ago. As Mr. LeVangie candidly admits, the implementation of safe yield and the use of minimum streamflows were stopped in the early '90s and the Department in the past 12 years "hasn't identified what safe yield is and minimum streamflow." (Tr. 3/208, 210). DEM stopped doing basin planning and developing

[22] The Department considered the USGS studies essential to its re-determination of safe yield and unequivocably committed to re-determining the safe yield of the Ipswich basin some five months prior to issuing the modified permits. (See Intervenors Exhibit 23).

[23] No inference should be drawn that the WRC stands behind the DEM minimum streamflow value for the Ipswich basin. In fact all indications are that the WRC, which originally had the issue of the Ipswich River basin reference streamflow on its meeting agenda for May, 2003, would support the 0.42 streamflow threshold. (Kerry Mackin rebuttal testimony and exhibit A; see also, Tr. 4/114-115, 120).

minimum streamflows shortly after the Ipswich River Basin Plan was issued because of serious concerns that were raised about the approach. (Tr. 3/208; 4/116; 125-126). In fact, the regulations requiring the WRC to develop basin plans, 313 CMR 2.00, were repealed in 1996.

The empirical data on actual streamflow conditions and environmental impacts, fish surveys, and scientific studies establishing the impacts of water withdrawals on streamflow, assessing aquatic habitat conditions, and recommending seasonal streamflow values are all "additional applicable information" under 310 CMR 36.31(1)(e) and "available safe yield information" under 310 CMR 36.33(4). The Department was not free to ignore this additional safe yield information.

It is not necessary to calculate the precise safe yield to find that the combined permitted volumes, 3.61 mgd in total, now allocated in the modified permits exceed the safe yield of the basin. (Intervenors exhibit 9). The totality of the evidence presented shows that even if all other provisions of the modified permits are complied with in full, a sizeable deficit will remain.[24] Additionally, community growth and new development will erode the savings gained by the water conservation measures. The modified permits explicitly authorize water withdrawals greater than those occurring today -- volumes that already cause significant environmental damage.

[24] As pointed out in the rebuttal testimony of Kerry Mackin, using a streamflow of 0.42 cfsm results in a determination that there is a flow deficit of 13.5 mgd (or 20.9 cfs; see Intervenors Exhibit 22) at the Ipswich USGS gage. The Ipswich River Watershed Management Plan uses the 0.49 cfsm seasonal streamflow recommendation of the Fisheries Restoration Task Group to determine the estimated water deficit of 14.4 mgd for July through September. Although using different baseline periods and thresholds, the two calculations result in a determination that there is a flow deficit of similar magnitude – 13.5 and 14.4 mgd as measured at the Ipswich streamflow gage.

B. The Modified Permit Conditions Fail to Protect the Interests of the WMA and Regulations.

The evidence presented by the Intervenors applies equally to the Intervenors' other claims, which although overlapping with the issue of safe yield,[25] are nonetheless independent claims. The USGS studies, target fish assessment, experience with actual conditions, stressed basin analysis, and water quality and gage data all establish the impact of the basin withdrawals on the interests protected by the WMA.

The Department is charged with establishing "a mechanism for managing ground and surface water as a single hydrological system, and ensuring where necessary, "an appropriate balance among competing water withdrawals and uses, *as well as preservation of the water resource itself*." (emphasis added).[26] G.L. c. 21G, § 3; 310 CMR 36.02. Permits are required to be conditioned on conditions that minimize the impact of water withdrawals on, and reasonably protect, water quality, navigation, water-based recreation, wetland habitat and fish and wildlife. 310 CMR 36.28(f); 36.26(1)(i). See also, G.L. c. 21G, § 7. In the past the scales have tipped very far to the water supply side. The conditions in the modified permits will not achieve the required balance between water withdrawals and environmental, economic and recreational uses, nor will they preserve the water resource itself or reasonably protect/minimize the impacts on the enumerated interests.

The Department acknowledges that instream uses have been seriously impaired by the low flows: "In many places in the Ipswich River, the promise of a flowing river

[25] For instance, the fact that the safe yield of the basin is exceeded is evidence relevant to the Intervenors' claims that a balance has not been achieved, the resource itself is not being preserved and that impacts to water quality, navigation, water-based recreation, wetland habitat and fish and wildlife are not being minimized.

[26] Mr. LeVangie agreed that the regulations do not provide for balancing preservation of the water resource itself. (Tr. 3/ 188).

that can be used in the summer months for fishing, swimming and boating is long since a memory." (Lamonte direct testimony exhibit A at p. 1; cover letters to the Towns' modified permits). Fishing, canoeing, kayaking, swimming, public water supply, habitat for fish, other aquatic life and wildlife, and warm water fishery are all existing uses in the Ipswich River -- uses that have been impaired or eliminated by the loss of flow in the river and its tributaries. The antidegradation provisions of the Massachusetts Water Quality Standards at 314 CMR 4.04(1) require that "[i]n all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."

The modified permit, conditions and provisions will continue to cause, alone and in combination with the other withdrawals authorized in the basin, the elimination or serious impairment of existing uses in the Ipswich River basin in violation of 314 CMR 4.04(1). Intervenors assert that this is strong evidence that the water resource itself is not being preserved, that a balance has not been achieved among competing uses, and that "reasonable protection" of water quality, water-based recreation, wetland habitat and fisheries and wildlife has not been accomplished.[27]

The evidence established that the Department did not have a reduction target or goal for necessary water savings when it reviewed and modified the permits. (Tr. 4/148) Rather, it adopted certain conservation measures intended to bring overall use down. However, the Department cannot say with certainty, with the exception of the seasonal cap or the 65 gallons per capita day performance standard, what these measures, which

[27] Mr. Levangie agreed on cross that the Department can consider MA water quality standards in the determination of whether reasonable protection of water quality has been achieved as required in the WMA and regulations. (Tr. 3/189). Intervenors believe that consideration of water quality standards is essential.

interact, will accomplish. The evidence showed that the prescribed water conservation measures will not meet the watershed-wide goal of 5.4 mgd in water conservation savings identified in the Ipswich River Watershed Management Plan to help make up the 14.4 mgd July-September seasonal deficit. See *supra,* at p. 10, fn. 14 and p. 17, fn. 24. Because the Department had no quantitative goal for how much withdrawals need to be reduced, it cannot say what its conservation measures will actually accomplish. Its wait and see approach (Tr.4/204) neither comports with nor accomplishes the Department's obligations under the regulatory scheme to preserve the water resource itself, achieve a balance and protect/minimize the impacts on the interests enumerated in 310 CMR 36.26(1)(i). See 310 CMR 36.28(1)(f); G.L. c. 21G, § 7.

C. A Water Bank Program that Takes Effect Now Is Required in the Modified Permits to Meet the Requirements of the WMA.

Actual withdrawals volumes have been significantly below the allocated amounts in the modified permits. Currently, Ipswich basin permit holders, including Wenham and Topsfield, are not using the volumes authorized through 2009 in their modified permits. In fact, water use by some of the communities remains below the volumes originally registered to them. Yet, the evidence showed that at withdrawal volumes lower than currently authorized, Ipswich River flows are drastically reduced or eliminated, as occurred in 2002, 1999, 1997 and 1995. According to Mr. Lamonte, if Wenham and Topsfield and the other permit holders were to withdraw their authorized volumes, conditions in the Ipswich River would be worse than they are today. (Tr. 4/94). This is because the allocations are set too high and cumulatively exceed the safe yield of the basin. Over time, these permits will not even maintain the *status quo* for the river since

development and growth will continually push water use in each community toward its full authorized volume, notwithstanding the other permit conditions.

The Department has several options to ensure that the safe yield of the basin is not exceeded, and that impacts to water quality, navigation, water-based recreation, wetland habitat and fish and wildlife are minimized and these interests are reasonably protected, as required in the regulatory scheme: it can either re-evaluate safe yield and reduce the allocations accordingly basin-wide, or it can impose a water bank to offset use going forward. A 2:1 ratio will also help to mitigate existing use. Intervenors, although not waiving their claim that the allocations should be reduced, assert that a water banking program is required now.

The Department acknowledges that "water banking is a reasonable and efficient approach to mitigation of the impacts of growth."[28] Indeed, it was the recommendation of the WMA Program that communities immediately consider implementation of a water bank (Lamonte exhibit B). Nonetheless, the modified permits require the Towns to institute a water bank that at a minimum provides for conserving/keeping at least two gallons of water within the basin for every additional gallon of water demand only if the Towns exceed their total authorized volume on an average annual basis. In other words, until the Towns go over their authorized volumes a water bank program is not required. This does nothing to address, or mitigate, the over-allocated condition of the basin today in clear contravention of WMA's intent. Additionally, even if all the other provisions of the modified permits are complied with in full, community growth and new development will erode the savings gained by the water conservation measures. Without such a

[28] Department's Post Hearing Brief in the Matter of Town of Wilmington at p. 10.

demand mitigation provision that takes effect now, Intervenors assert the modified permits are fatally flawed.[29]

Ms. Mackin testified about the effectiveness of Weymouth's water banking program in keeping the Town below its registered water withdrawal volume. The details of the program are contained in the affidavit of Bradley Hayes, Weymouth's Water and Sewer Superintendent. (Intervenors exhibit 24). Weymouth has moved toward a fee-based program, which applies broadly to new development, including chapter 40B developments, expansions that result in a change of use of building space or add bedrooms, and new industrial/commercial processes. This approach has proven successful in providing resources to reduce water demand without adverse impacts on economic development.

Mr. LeVangie testified on cross that he believed it would be "highly beneficial" for the communities at this time to implement water banking. (Tr. 3/142). One reason for this is because the communities are not withdrawing at the volumes authorized in the modified permits (Tr. 3/143). Yet the River is already highly stressed. (See also Tr. 3/39 and direct testimony of Louis Wagner). Mr. Lamonte agreed on cross that for many communities the water bank provision would not take effect before the permits expire in 2009. (Tr. 4/157).[30]

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[29] It also was arbitrary and capricious and an abuse of discretion.

[30] While Wenham may be growing by one or two houses a year at present and according to Greg Krom there is not a lot of projected growth in Topsfield beyond the projects he described in his supplemental direct testimony, these current trends do not undercut the need for water banking now. As Kerry Mackin testified there are a number of residential expansions (as opposed to new housing starts) taking place in these communities that would trigger the water bank (Tr. 3/7). In addition, future growth cannot be assumed to conform to recent patterns and may accelerate. A water bank is much less effective if it only takes effect after development has already occurred. (Tr. 3/39).

A water-banking program can offset, or mitigate, new or increased demand and accommodate growth while ensuring sustainability of the water resource. This is squarely within the interests and purview of Department's authority under the WMA as the Administrative Magistrate found in his Ruling on Legal Issues. There are several ways in which a water-banking program can be structured and the Towns should be given the flexibility to develop a program suited to their individual situations. A water bank program can provide resources to improve residential water conservation through rebates and retrofits, incorporate new technologies, and improve stormwater recharge, as well as contribute to sustainable water resource management.[31]

Requiring the Towns to conserve or keep within the Ipswich River basin at least two gallons for every gallon of new water demand through expansions, redevelopment and new development projects would, Intervenors believe, be an effective remedy. A water bank program will offset, or mitigate, new or increased demand and accommodate growth while ensuring sustainability of the water resource.

Intervenors propose that the following language be added to each Town's modified permit under Special Condition 1

> **The Town shall on or before March 1, 2005 submit to the Department for its review and approval a plan and schedule for immediately implementing a water bank. The Town shall implement the water bank forthwith.**
>
> **At a minimum, this water bank shall provide for conserving, or keeping, within the Ipswich River basin, at least two gallons of water for every gallon of water demand added to the system as a result of new development, redevelopment or expansion.**

[31] Leak detection and repair would be one productive avenue for water banking in the Towns since leaks within homes were identified by Blake Martin as potentially a bigger use of water than nonessential outdoor water use (Tr. 2/9),

D. Other Permit Provisions Must Be Strengthened so that the Purposes and Requirements of the WMA and Its Regulations Are Met.

1. Streamflow triggers

Intervenors assert that a higher streamflow trigger should be set for mandatory restrictions; that the trigger for voluntary restrictions should be replaced by a seasonal (May-September) voluntary restriction; and that effective communication of mandatory restrictions should be required in the permits.

Recognizing the delay between reducing groundwater pumping and recovery of streamflow, the Fisheries Task Group recommended that management actions be "taken earlier, at higher streamflows than the recommended fisheries thresholds, to prevent flows from going below the recommendations and damaging the resource." (Intervenors exhibit 21 at p. 8, 10).

Because reducing water use results in less pumping of the communities' wells, and because of delays due to the need to alert the public about restrictions, restrictions need to be implemented well in advance of streamflow actually reaching the 0.42 cfsm threshold. As Ms. Mackin testified on direct, waiting until the 0.42 cfsm threshold is reached before requiring mandatory restrictions will likely result in the upper reaches of the river drying up, and unnaturally low-flows throughout the river. For the streamflow trigger to be an effective tool, mandatory restrictions need to take effect when streamflow falls to 0.67 cfsm. (Tr. 3/22). This 0.67 cfsm streamflow provides "good" summer habitat condition based on the Tennant Method, as opposed to the "fair" Tennant habitat condition reflected in the 0.49-0.42 cfsm figure (Tennant, 1976).[32] While there is

[32] The Tennant Method is one of the five methodologies used by USGS and MA DFW in the Aquatic Habitat Study for comparison in determining flow requirements in the Ipswich River for the protection of aquatic habitat.

disagreement over the immediate effectiveness of use restrictions tied to streamflow triggers because of lag time between reduced pumping and streamflow recovery as discussed below, Intervenors draw the opposite conclusion from the Town of Wenham. Rather than abandoning mandatory triggers, the streamflow threshold should be set higher, which would result in mandatory restrictions taking effect well in advance of flows reaching and going below 0.42 cfsm. The Department failed to provide an appropriately conservative protective approach that takes account of lag time in both notification as well as the effects of well pumping in establishing the 0.42 cfsm streamflow trigger for mandatory restrictions.

Additionally, both Gregory Krom and Bruce Blanchard agreed that mandatory bans are an effective water use reduction measure. Mr. Blanchard testified that water use is reduced 25-30% with mandatory bans (Tr. 1/74; see also 1/160); according to Mr. Krom voluntary "bans" result in only marginal reductions. (Tr. 1/50; see also 3/77). Intervenors and Wenham presented testimony that newspaper notification to the public can take several weeks from when a streamflow trigger is first reached (Mackin direct testimony at p. 22-23; Tr. 3/17-18; 1/50). While Mr. Peters testified that the Department envisioned public notices in the newspaper to be one small portion of instituting a water ban and that townspeople would be notified promptly through signage in town and other means (Tr. 4/18-19), the Towns' modified permits do not require this. Following the letter of this provision, the Towns are only required to post legal notice in the newspaper of the restrictions once streamflow falls below the trigger for three consecutive days. This gap between the Department's expectations and the permit requirement should be

rectified by language requiring in addition to the legal notice, effective communication of the restriction.

Because the streamflow thresholds for voluntary and mandatory restrictions are set so close together, at the time the public is receiving notification that voluntary restrictions are in effect the streamflow trigger for mandatory restrictions frequently will have been reached. (Blanchard and Mackin testimony).[33] The Department concurs that the time between voluntary and mandatory restrictions might be "fairly short." (Tr. 4/19; Zachary Peters direct testimony exhibit D). These triggers coupled with the public notice provision will result in public confusion, making it difficult to achieve timely compliance.

There is also an on-again off-again aspect to the voluntary and mandatory triggers that will make enforcement difficult. (Mackin direct testimony at p. 23). Because it "makes sense to always conserve water," (Tr. 4/39) and particularly in this highly stressed basin, where Intervenors believe voluntary water conservation should be a way of life in the summer months, the permits should be changed to require that voluntary restrictions automatically be in effect May1-September 30 and that the Towns provide effective notification (in addition to legal notice) when the restrictions become mandatory.

For all of the reasons discussed above, the Intervenors propose the following revision to Special Condition 6 of the Towns' permits:

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[33] Ms. Mackin's direct testimony at p. 22 was that "[b]y the time the voluntary threshold is triggered, typically the mandatory threshold will be reached in a matter of a few days." She explained that based on actual USGS streamflow data from 1999-2002, the streamflow triggers are typically reached within 1-6 days of each other, with the voluntary trigger reached on average about 3 days before the mandatory trigger (provided the low flow period lasted at least 3 consecutive days, as specified in the modified permits).

Beginning on May 1, 2005, the Town shall implement voluntary water restrictions from May 1 to September 30 of each year. The Town shall implement mandatory water restrictions whenever streamflow falls below 0.67 cfsm for 3 consecutive days as measured at the USGS stream gauge noted.

[the 0.56 cfsm voluntary restriction portion of the chart would be eliminated and the <0.42 cfsm and corresponding cfs flow volume would be changed to <0.67 cfsm and 83.75 cfs, respectively].

2. A Streamflow Trigger for Mandatory Restrictions Is a Proper Condition In Wenham's Permit.

The evidence was clear that the Department employed a basin-wide approach to the modified permits and that it took into account the relative impacts of communities' withdrawals and septic system returns in its permit modifications. Mr. Lamonte agreed that the Department's goal was year-round management of this complex hydrologic system in a way that would provide water supply but also protect in-stream uses." (Tr. 4/105). The USGS hydrologic model and habitat assessment reports supported the Department's determination that Wenham and Topsfield's withdrawals[34] impact the basin's water resources. Nor did John Kastrinos, Wenham's expert, dispute the fact that Wenham's withdrawals impact Idlewild Brook, a tributary to the Ipswich River. Rather, his contention was that streamflow triggers for Wenham are "not reasonable" because "they place undue hardship in the form of lost lawns and plantings"[35] and will not

[34] Topsfield did not contest the impacts of its withdrawals on Ipswich River and tributary flows except to bring out during cross examination that its withdrawals comprise about 1/60 of the total withdrawal from the basin. In fact, Topsfield's withdrawals from 1998 to 2002 were about 6% of the year-round average total groundwater withdrawals and about 8% of total summer groundwater withdrawals. (Tr. 3/73). Wenham's withdrawals during this same period were about 4% of year-round groundwater withdrawals and and 6% of summer groundwater withdrawals. *Id.*

[35] Mr. Kastrinos admitted that he was not an expert on lawns or horticulture. Mr. Blanchard acknowledged that grass goes dormant when not watered but greens up again. See also, Guide to Lawn and Landscape Conservation, Peters exhibit I. In any event, the modified permits allow hand-held watering of shrubs and lawns, albeit during restricted hours.

achieve the "desired benefit of increasing streamflow in the Ipswich River during low flow periods . . . " (Kastrinos rebuttal testimony at p. 6). However, his assumption was that the "low-flow periods" correspond to the May-September period when seasonal restrictions would be in effect. This assumption is erroneous. A key reason for using the streamflow triggers for the period May-September is because these are the highest water use months and thus present the greatest opportunity to reduce use, which in turn will benefit flow year-round. Low flows are in fact a year-round occurrence and the Department is not just concerned with improving summertime flows, contrary to Mr. Kastrinos' assumption. Intervenors believe that the Department's approach in this regard was entirely proper and warranted.

Ironically, although Wenham claims that the Department should have looked at local conditions, its own expert did not even look at the cumulative impacts of the combined withdrawals of Wenham and Hamilton on the Idlewild Brook subbasin. (Tr. 2/77, 87).[36] Nor in proferring his opinion did Mr. Kastrinos factor in the second Wenham well, which is closer to the stream and pumped more in the summer, or the greater 40 foot depth (and therefore greater penetration into the aquifer) of Pleasant Pond, which is closer to Wenham's wells than Idlewild Brook. He testified that his assessment for Wenham was not intended to estimate the cumulative effects of pumping of both of Wenham's wells, but rather to compare to the specific example of streamflow depletion

[36] Mr. Kastrinos concurred with Mr. Lamonte that reducing the pumping rate of streamside wells would likely reduce stream depletion in a timely fashion; however, while he observed one of Hamilton's wells within 50 feet of the stream, he couldn't say whether he would consider this "streamside." (Kastrinos rebuttal at p. 5; Tr. 2/95-96; 2/122). He also agreed that reductions in pumping rates from more distant wells would have a benefit on reducing intercepted baseflow. *Id*.

regarding Wenham Well #1 that USGS presented in an appendix to the Hydrological Model Report. (Tr. 1/90; 2/85-86)

The Department is not just concerned with the mainstem,[37] but also with the health of the Ipswich River tributaries like Idlewild Brook and other surface waters such as Pleasant Pond. Evidence presented by the Intervenors through the testimony of Nigel Pickering, PhD, established that the combined withdrawals of Wenham's two wells and Hamilton's four wells in the subbasin approach one million gallons per day in the summer months. (Tr. 2/135-136). Dr. Pickering testified that the combined withdrawals are two times, or 200%, of the August median flow of this small 2.6 square mile drainage area. (Pickering rebuttal testimony at p. 5; Tr. 2/136-137). He estimated that at least 100% of the August median flow is a net withdrawal and that "that is a huge withdrawal" relative to the size of the subbasin. (Tr. 2/136-137).[38] In Dr. Pickering's opinion, Idlewild Brook has been highly impacted by the withdrawals. (Tr. 165-166). According to the USGS model and data, under a no pumping scenario, Idlewild Brook never dried up; with pumping, the brook goes dry 55% of the time. (Tr. 2/149-150).

There is no real dispute that Wenham's withdrawals reduce flows in Idlewild Brook and the Ipswich River. Mr. Kastrinos testified that the aquifer supplying Wenham's wells in his opinion extends to the other side of the Ipswich River (Tr. 2/107),

[37] The Department is not just concerned with upper watershed conditions and low flows are not just an upper basin problem as Wenham and Topsfield's witnesses appear to suggest. (Tr. 3/185). Mr. Blanchard admitted that extremely low flows have occurred at the Mill Road riffle, Ipswich/Hamilton. (Tr. 1/98; Intervenors exhibit 7; see also 4/107; 160). Mr. Lamonte testified on cross that the USGS Habitat Assessment Study showed, and the WRC's Stressed Basin report supports, that the lower part of the river is also affected by low flows (Tr. 4/102). Mr. Kastrinos testified the 36% of the deficit at the Ipswich gage is not the result of conditions upstream of the South Middleton gage. (Tr. 2/123).

[38] The WRC's Stressed Basins Report specifies a methodology for determining stress of ungaged sub-basins, under which a net withdrawal exceeding the August median indicates that a sub-basin is "highly stressed." (Intervenors exhibit 3 at p. 23).

and agreed that reducing summer or year-round demand will benefit the river by reducing intercepted baseflow. (Tr. 2/59, 2/91).[39] Baseflow is what keeps the river flowing when there is no precipitation for two or three motnhs; it is basically the groundwater contribution to baseflow. (Tr. 2/59).[40]

While Mr. Kastrinos and Dr. Pickering disagreed about the calculation of the specific lag time[41] for 50% streamflow recovery if pumping of Wenham Well #1 were stopped,[42] lag time is of limited utility and, Intervenors suggest, somewhat of a red herring here for a number of reasons. First, lag time does not change the average annual

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[39] Blake Martin, agreed "in general" that pumping Wenham's wells results in a net reduction in baseflow to the Ipswich River and that decreased demand will increase baseflow to the river. (Tr. 2/27).

[40] He also agreed that pumping Wenham's wells has the potential to affect water levels in Pleasant Pond and that Hamilton's wells may also affect pond and swamp levels (Kastrinos rebuttal at p. 10; Tr. 2/61-62, 2/83.

[41] Mr. Kastrinos and Dr. Pickering agreed that the streamflow depletion program in the USGS model overestimated streamflow depletion by 6%. Where they disagreed was the "effective distance" and therefore lag time for a 50% reduction in streamflow depletion, with Dr. Pickering estimating lag time on the order of a month and Kastrinos estimating lag time as ten months to a year (Pickering rebuttal testimony; Kastrinos direct testimony).

Primarily at issue was the partial penetration of the streambed. (Tr. 2/157). The USGS study made an assumption that Idlewild Brook fully penetrates the aquifer. Asked by the Magistrate if this was a standard assumption for this type of modeling, Mr. Kastrinos seemed to agree, testifying that for a basin-wide model "they may choose to do that because it's simpler." (Tr. 2/104). Dr. Pickering testified that the USGS model in his opinion used appropriate inputs: by choosing a conservative value for diffusivity (another form of permeability, or hydraulic conductivity) USGS has attempted to offset its lack of knowledge on lack of streambed penetration and streambed resistance. (2/165).

Dr. Pickering went back and looked at the actual Spalding and Khaleel method: when he assumed that the streambed was fully penetrating, the effective distance should have equaled the actual distance. Instead the Spalding and Kahleel equation gave an effective distance of about three times the distance. Tr. 2/133-134. Therefore, Dr. Pickering used a more intuitive assumption of a vertical distance of 75 feet and a horizontal distance of 486 feet. (Tr. 2/134). Using the streambed permeability numbers provided by Mr. Kastrinos, Dr. Pickering then calculated streambed resistance, or leakance, which he found made only a small difference in the lag time (increased by 0.2 months). (Tr. 2/135; 157). In order to make a realistic assessment, he looked at both of Wenham's wells and took into account the fact that Well No. 2 is pumped more in the summer than Well No. 1. In Mr. Kastrinos' opinion, it was appropriate to use the Spalding and Khaleel correction and Dr. Pickering's approach oversimplified the problem (Tr. 3/94).

[42] While Mr. Kastrinos' estimation of a 10-month to one-year lag time was premised on a 50% return in streamflow, this ignores the fact as Mr. Peters pointed out that some recovery occurs much sooner. (Tr.4/23).

withdrawal. Dr. Pickering explained that regardless of lag time any water conservation program would result in a reduction in the average annual withdrawal and that would benefit Idlewild Brook and the river because they would reduce the streamflow depletion. (Pickering rebuttal testimony at p. 1; Tr. 2/158-159) "So even if the lag time were gigantic, the river would still benefit in all periods of the year from the seasonal cap strategy." *Id.* Moreover, low flows are not just a summer occurrence in the Ipswich River. Rather, they occur year-round and in fact in 64 out of 72 years, flows below 0.42 cfsm at the Ipswich gage occurred in the period October to April (Tr. 4/15; 3/20). When asked if pumping reductions in the summer would show up the following summer if there was a one-year lag time, Mr. Kastrinos concluded "they could." (Tr. 3/101). Mr. Peters agreed that with a 12-month lag time one would expect to see the effects the following summer. (Tr. 4/47).

Lastly, since all wells have different lag times basing water restrictions on different lag times is simply not practicable and would create both a public communication problem and an enforcement nightmare for the Department. In sum, the Department's approach using basin-wide streamflow triggers was entirely proper and warranted.

3. The Seasonal Cap for Both Wenham and Topsfield Should be Lower.

Lawn watering in the summer months is a significant portion of water use with, according to Bruce Blanchard, a "significant impact." (Tr. 1/104). Dr. Pickering testified that on an average annual basis consumptive use of water for irrigation is about 20% and can peak at 40% during the summer months. (Tr. 2/140).[43] The watershed-wide deficit

[43] Mr. Kastrinos agreed that irrigation is substantial fraction of summer demand and that in comparison to other communities in the Ipswich basin Wenham's summer to winter ratio is "quite high." (Tr. 2/79-80).

of 14.4 million gallons identified in the Management Plan necessary to restore healthy flows to the Ipswich River, is approximately equal to the amount of water used for lawn watering. (Mackin direct testimony at p. 23 and exhibit 29 at p. 6-2).

Imposition of a summer cap, which is directed at outdoor consumptive use, contributes to overall water savings in the Ipswich River basin, and Intervenors agree that is an important component of the Towns' modified permits.[44] However, Dr. Pickering testified that "Overall, the summer cap[s] will not result in a great deal of water savings." (Pickering direct testimony at p. 2). The basin-wide savings would only be 1.1 mgd, or 2.8% for an average summer and 3.7 mgd, or 8.5% in a dry summer. (Pickering direct testimony at p. 2; 2/139). This is far short of the 5.4 mgd summer water conservation goal in the Watershed Management Plan (Intervenors exhibit 29 at p. iii, 6-2; Tr. 4/150-151). Dr. Pickering testified that a seasonal cap with an effective water savings of less than 10% basin wide will have a small effect on the river unless combined with recharge of wastewater and/or stormwater. (Pickering direct testimony at p. 3; Intervenors exhibit 33 at Figure 12 and 13).

The Regional Water Conservation Plan, establishes a minimum 20% reduction target in summertime water use basin-wide from 1999 use levels (Intervenors exhibit 28, at p. 15; Tr. 3/25). However, both Topsfield and Wenham's cap are less than this: projected reductions in average summer use for Topsfield and Wenham are 10.4% and 14.9%, respectively. (Pickering direct testimony at p. 2). If all communities were held to a summer to winter ratio of 1.2 and given a reasonable amount of time to achieve the

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[44] Dr. Pickering testified that the river would benefit in all periods from the seasonal cap strategy because it will result in an average annual reduction in streamflow depletion. (Tr. 2/159). It is an institutional way of to address outside water use. (Pickering direct testimony at p. 3).

ratio, this would result in an increase in water savings to 7.4% in an average year and 12.9% in a dry year. (Pickering direct testimony at p. 3). Intervenors assert that both Towns should be given a reasonable amount of time to achieve this ratio.

Intervenors propose the following revision (in bold) to the Performance Standard for Seasonal Water Use in Special Condition 7:

> Water use between May 1st and September 30th shall not exceed the seasonal cap of 61.2 million gallons [for Wenham] [84.15 million gallons for Topsfield]. To stay within this cap, Wenham [Tospfield] shall keep its water use at or below an average daily volume of .40 MGD [.55MGD for Topsfield] from May 1st thru September 30th. **Beginning in calendar year 2007, water use between May 1st and September 30th shall not exceed a seasonal cap of 49.6 million gallons million gallons [for Wenham] [72.2 million gallons for Topsfield] and Wenham shall keep its water use at or below an average daily volume of .32 MGD [.47 for Topsfield] from May 1st thru September 30th**. If the Town exceeds this seasonal cap, the Department may require the Town to implement more stringent restrictions on nonessential outside use than those set forth in Special Condition #6.

4. Industrial and Commercial Water Conservation Program

Recognizing that industrial and commercial (IC) sector participation is an important component of any water conservation program to reduce use in the Ipswich basin, Intervenors believe that all of the modified WMA permits with the exception of Topsfield's contain a provision requiring implementation of an industrial and commercial water conservation program for either the five or ten largest IC users in the community. Some of the modified water permits issued by the Department in the Ipswich basin require a water use reduction program for the five (or ten) "largest customers," rather than limiting the program's applicability to "industrial and commercial customers." (Tr. 3/239-40).

The Department's failure to require Topsfield to implement a program to reduce water use by its largest users in the modified permit was arbitrary and capricious and an

abuse of discretion. Topsfield's modified permit states under Special Condition 11 that "since the amount of commercial and industrial use is substantially less than residential, municipal, and institutional (school) use[, r]esources will be better spent on reducing seasonal use water use and residential gallons per capita per day." However, as Ms. Mackin testified, a comparison of Wenham and Topsfield's 2003 Annual Statistical Reports (ASR) shows that Wenham has an even higher percentage of residential use and similar industrial and commercial use to Topsfield's. Topsfield reported its water use as: 68.6% residential; 2% school; 1.1% medical facility; 1% industrial/agricultural; 5.6% commercial; and 14% municipal. (Mackin direct testimony at p. 20 and exhibit 25). Wenham reported 81.16% residential; 0.35% school; 0.70% institutional; 0.69 industrial/agricultural; and 4.18 commercial water use in 2003. (Mackin direct testimony at p. 20 and exhibit 26). Wenham's 2003 total water use (116.6 mgd) was less than Topsfield's (172.7 mgd). There is no rational basis for exempting Topsfield from this requirement while requiring Wenham to institute an IC program.

Mr. Tomczyk, who testified on cross that he did not compare IC use in Wenham and Topsfield, said that he is now aware that IC use is about the same in both communities (Tr. 3/238-239). Topsfield also responded in the Order to Complete at p. 8 that " a large number of residential accounts meet or exceed" IC use. (Tr. 3/239-240). Under these circumstances it may be more appropriate to require Topsfield to implement a program to reduce water use by its ten largest users, rather than limiting it to IC users.

Nor does not make sense to exclude municipal and institutional use from Special Condition 11 for either Wenham or Topsfield. Ms. Mackin explained that the *Water Conservation Standards for the Commonwealth of Massachusetts,* adopted by the WRC

(1992) ("Water Conservation Standards") groups industrial, commercial and institutional (ICI) water use together as a category. (Mackin direct testimony at p. 20 and exhibit 27, at p. 16). There is no basis for the Department to exclude institutional use from this program requirement. Ms. Mackin also testified that municipal use should also be included because the Towns should serve as an example to the public, and it is also true that they have ability to reduce water use by their own offices and services. Topsfield's municipal use is substantial: 14% of its total water use in 2003 was municipal and another 2% was school use. Wenham did not report its municipal use separately in its 2003 ASR and it is unclear whether it is captured as part of residential use.[45]

The commercial and industrial conservation program contained in Special Condition of 11 of Wenham's permit is also not an effective provision for a number of reasons. One reason is that the language is both weak and vague: it merely requires Wenham to "implement a program to reduce water use " and to report on the program's effectiveness. While the Department reserves the right to require "additional actions," it provides no guidance on what will suffice in the first instance. Consistent with this permit language Wenham's program could simply consist of sending letters to the largest users asking them to reduce their use.

The Water Conservation Standards recommend that all industrial and commercial water users carry out a water audit and that the findings be the basis of actions to conserve water. As Ms. Mackin testified, " A water audit looks at all of the water uses within a facility, the processes, the plumbing and such, and recommends measures that

[45] Clearly some uniformity in how suppliers report water use by sector is necessary. The Water Conservation Standards have a public sector use category that also includes school departments and hospitals.

should be taken to save water. A water audit is really the starting point for any kind of industrial or commercial water conservation program . . ." (Mackin direct testimony at p.21). A water audit should be an explicit requirement of Special Condition 11 of both Wenham and Topsfield's permits, as should water use reduction goals based on the audits and a plan and timetable for achieving the use reduction goals

Intervenors' propose the following language in Special Condition 11 of Topsfield's permit and that similar changes be made in Wenham's permit: [46]

> **The Town shall implement a program to reduce water use by its ten largest water use customers. At a minimum the program shall require for each user a water audit, water use reduction goals and a plan and timetable for achieving the goals, all of which shall be submitted to the Department on or before [insert date (six months from permit effective date)]. The Town shall report yearly thereafter to the Department on the effectiveness of the program until the water use reduction goals have been achieved. Upon receipt of the information the Department will take whatever action it deems appropriate to promote the interests of the Water Management Act including without limitation modification of this Modified Permit to require additional actions to reduce water use by the largest customers.**

5. Leak Detection Should be Required Every Two Years in Wenham's Permit

Although Topsfield is required to conduct a full leak detection survey of its water system every year pursuant to its modified permit, Wenham will now be required to perform leak detection every three years under its modified permit. Previously, the Department was requiring Wenham and most of the other basin WMA permit holders to perform a leak detection survey every two years by Wenham.

[46] Intevenors take no position on whether Wenham's Special Condition 11 should be changed from 10 largest IC users to simply the 10 largest users.

Ms. Mackin testified that leak detection every two years is the water supply industry standard and the Water Conservation Standards, Intervenors exhibit 27 at page 11, explicitly prescribe that a "full leak detection survey of the distribution system should be completed every two years." (Mackin direct testimony at p. 21; Tr. 3/14). Leak detection of the complete water system *at least* every two years is also recommended in the *Regional Water Conservation Plan for the Ipswich River Watershed* (Regional Water Conservation Plan), which was ratified by the Ipswich River Management Council.

This is money well spent and "Detecting and fixing leaks can provide one of the largest returns on investment . . ." (Mackin direct testimony at p. 21; Intervenors exhibit 27; Tr. 3/37). The requirement that if unaccounted for water increases by 5% or more over the percentage reported in Wenham's Annual Statistical Report for the prior calendar year that Wenham is required to perform a leak detection survey of its entire distribution system cannot substitute for biennial leak detection. Under the Department's provision leaks could persist for up to another year without repair, potentially representing significant volumes of water. This is a step backwards and Special Condition 9 of Wenham's modified permit should be changed to require a full leak detection survey at least every two years.

6. Topsfield

The Intervenors join the Department's Post Hearing Brief argument parts A and B with respect to the allocation and seasonal cap issues raised by Topsfield.

V. CONCLUSION

For all of the reasons discussed above, the Towns' modified permits should be changed to include water banking now, voluntary outdoor water restrictions throughout

the summer regardless of streamflow, a higher streamflow trigger for mandatory restrictions, more effective communication of the trigger, lower seasonal caps, a stronger industrial commercial water conservation program under Special Condition 11, a water conservation program for the ten largest water users (Topsfield), and leak detection every two years (Wenham).

Respectfully submitted,
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