

October 13, 2009
Secretary Ian A. Bowles
Executive Office of Environmental Affairs – MEPA Office
100 Cambridge St.
Boston, MA 02114

Attn. Anne Canaday, MEPA Analyst

Via Email

cc.

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COMMENTS IN RESPONSE TO FINAL ENVIRONMENTAL IMPACT REPORT, BIRCH
ROAD WELL SITE REACTIVATION, FRAMINGHAM
EOEA NUMBER 14197

Dear Secretary Bowles and Ms. Canaday:

These comments are directed to the impact of the proposed new withdrawal on the Sudbury River adjacent to and downstream of the location of the Birch Road wells. I stated in my comments to the DEIR my belief that the proposed withdrawals will have a devastating effect on the river which CANNOT be mitigated with management strategies under the Water Management Act, as claimed by the proponent. In the FEIR the proponent presents a withdrawal management trigger scheme which he claims will address the possibility of the new withdrawals leading to radical flow reduction or complete depletion of flow in dry years. In the following analysis I test that scheme and prove that it does not work. As a result, the proposed reactivation project will have a direct and adverse impact on the river.

If the proponent believes there is another scheme which will satisfy the goal of protecting the Wild and Scenic Sudbury River from seasonal dewatering, and therefore effective destruction of the Wild and Scenic values for which it was recognized by the Congress of the United States, it should present said scheme in a Supplemental Environmental Impact Report.

In my comments to the DEIR, I suggested that any mitigation scheme proposed by the proponent be tested against the historical record for the two driest recent years, 2001 and 2007. If the proponent had done so he would have discovered that the proposal does not work before publishing the FEIR and requiring reviewers to do the testing. I suggest any future scheme be tested before publishing so as to not force members of the public and other agencies to perform analyses that should have been done by the proponent.

RIVER FLOW, 2000-2008

The following graph of flow at the Saxonville gauge from 2000 through 2008 was generated by the USGS website, which provides a wealth of tools to examine river flow from 1979 to the present.

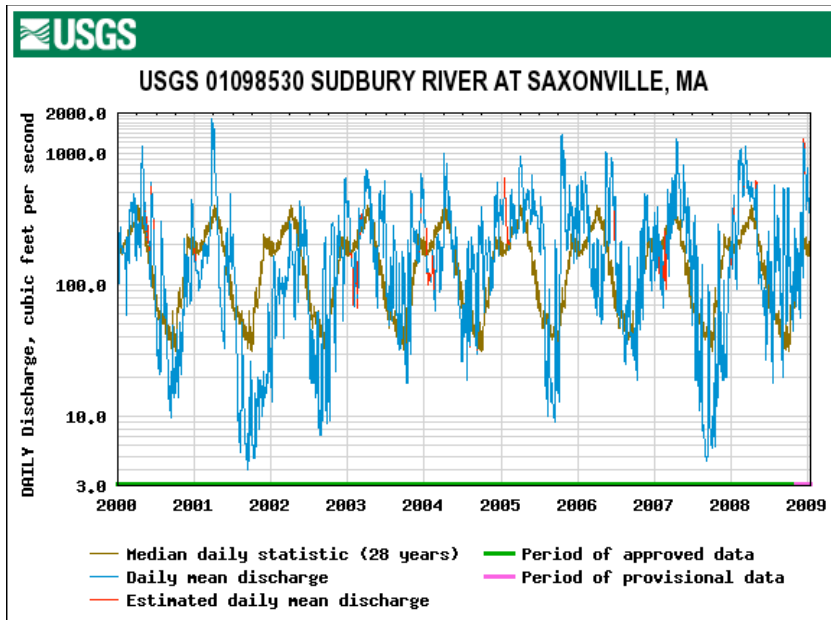
A number of elements are worth noting in this graph relevant to evaluating the proposed withdrawal management scheme proposed by Framingham.

1. Every single year in this decade saw flows as low as 20 cfs. Even at the new, reduced proposed withdrawal level, Framingham would have withdrawn at least 25% of the flow every year. Two of the nine years saw flows under 5 cfs, less than the proposed withdrawal rate. Three other years saw flows under 10 cfs. So in five out of nine years the proposed withdrawal rate would have exceeded 50% of the river flow.

2. Similar graphs generated by the USGS website show that in the 1990's, flow also dipped under 10 in five years, but the lowest recorded was 5.6 in October of 1997. Thus the entire decade was significantly wetter than the last ten years. In the 1980's, flow dipped under 10 in only two years. The lowest was 9.5 in October of 1983. The record therefore shows a clear progression over the last thirty years to much more frequent and much dryer dry periods. This is in accord with the comments this writer made to the DEIR, and is probably a result of both increased watershed development and global warming. Whatever the reason, it implies that the statistical analyses made in the FEIR are specious. Combining the wetter data from early in the 30 year record with the much more concerning recent data creates the impression that the proposed withdrawals are much less damaging than they are likely to actually be.

3. As a preliminary evaluation of the notion that low flows in late summer can be predicted by some sort of "trigger" earlier in the year, one can eyeball the average flows in the first half of each year and observe the correlation with the lowest flows in the last half. There does not appear to be any correlation, which is in accord with basic river hydrology: high winter and spring flows result from surface runoff, while late summer and fall base flows are maintained by discharge from groundwater aquifers. Since these sources are not directly correlated, there is no reason to believe that summer and fall low flows can be predicted by any kind of a trigger mechanism early in the year.

4. There is a clear grouping of the years in this graph: driest (2001 and 2007, when flows dropped under 5 cfs), wettest (2003, 2004, 2006, and 2008, when flows bottomed at about 20 cfs), and the intermediate years (2000, 2002, and 2005). In the analysis that follows I will group the actions taken as a result of applying the proposed algorithm similarly into three groups, most severe, least severe, and intermediate, and comment on the correlation between proposed action and result.



NB. In the 90's, flow dipped under 10 in five years. Lowest was 5.6 in 10/97
 In the 80's, flow dipped under 10 in two years. Lowest was 9.5 in 10/83

DETAILED ANALYSIS OF PROPOSED OPERATIONAL PLAN

1. Groundwater Travel Time

The fundamental issue this writer raised in the DEIR comments, and which was subsequently raised by a number of other commenters, was the lack of determination of the groundwater flow time from the wells to the river (or the lake, which is about the same distance). This will determine the lag time from action taken to change withdrawal rates at the wells and effect on the river. The FEIR attempts to minimize this issue, arguing that the "precise" time lag is unimportant. That may be true, but the issue is not the "precise" lag but the order of magnitude. It is currently unknown whether the lag is a week, a month, or a year. Indeed, as I commented to the DEIR, the fact that the edge of Zone 2 is at the river, and Zone 2 is defined as the zone of contribution after six months of pumping, strongly suggests that the lag is on the order of six months. Whether it is actually three months or nine months is probably irrelevant, as very large flow changes occur on sub-month time scales. See, for example, 2001, where the flow on July 1 was 243, but by July 27 dropped to 13.

The proponent argues that the recovery time of SEA-4 after the pump test indicates a high aquifer transmissivity, and the 16 day recovery time would hold true for higher pumping rates as well. I believe this argument also to be specious. The time to refill the cone is a function of both transmissivity and travel distance, and also the volume of water available to refill the cone. The test pumping only lasted a month and at a lower rate than the proposed actual operational pumping, so the size of the cone of depression was much smaller than it will be under operational conditions, and the volume to be filled by surrounding aquifer water was a small fraction of what would need filling in actual operation. Furthermore, as the cone enlarges it will encounter subsurface boundaries, such as the one the proponent contends exists along the Wayland-Framingham town

line. No water will be able to fill the cone from the direction of such boundaries, whereas for a smaller cone water is available from every direction. Therefore it will take much longer to refill a large cone than a small one.

Furthermore, in actual operation the general natural direction of groundwater flow will matter. Flow is generally from the lake (or the aquifer underlying the lake) to the river. If the entire aquifer between the lake and the river is depleted (and the assumption that 30% of the recharge is induced from the lake indicates so) then water will have to travel the entire distance from the lake to the river to restore the natural base flow. The applicant contended in the DEIR that a subsurface barrier exists at the river, so water from the other side of the river will not be able to flow towards the well to fill the cone. All these effects will make the lag time from action at the wells to result at the river much longer than 16 days.

2. Testing the Proposed Algorithm

It is somewhat difficult to understand the details of the proposal. Specifically, it is unclear whether the proposal is to adjust operation as a function of the flow on the actual date indicated, or at any point within any time interval between trigger points. It is made clear with respect to the July 1-July 27 interval, but not for other time periods. Hence, I have looked at the first three trigger periods and applied the algorithm both ways.

The following analyzes each year from 2000 through 2008. The first set of points to be analyzed is for the proposed January 1- July 1 trigger period:

Year	January 1 Discharge	Action?	Action before next trigger?(Date of Action)
2000	81	80%	80%
2001	207	100%	80%(4/29)
2002	17	80%	80%
2003	350	100%	80%(1/25)
2004	311	100%	80%(2/19)
2005	321	100%	100%
2006	481	100%	80%(3/10)
2007	159	100%	80%(2/2)
2008	199	100%	80%(6/13)

As can be plainly seen, there is no correlation between proposed action and the ultimate severity of the late summer flow. The two years when the Jan. 1 flow was low saw late summer low flows between 5 and 10 cfs, certainly dangerously low but far from the worst reached in 2001 and 2007. In 2007 the trigger was reached early in the period, but in 2001 it was not reached until more than halfway through the period. The trigger was reached every year at some point between January and July 1, except in 2005 which was a middling year, summer-flow wise. The bottom line is that the proposed algorithm simply does not work for the January 1-July 1 interval.

The next proposed trigger date is July 1, with the following results:

Year	July 1 Discharge	Action?	Action before next trigger? (Date of Action)
2000	50	80%	30%(7/15)
2001	243	100%	30%(7/23)
2002	45	55%	30%(7/8)
2003	147	80%	80%
2004	44	55%	55%
2005	257	100%	100%
2006	160	100%	80%(7/8)
2007	148	100%	30% (7/16)
2008	112	80%	30%(7/18)

2001, one of the two worst years, would have seen only moderate restrictions compared to other years. The 2002 restrictions were relatively draconian, but the year was only moderately bad. 2004 would have seen moderate restrictions and was a relatively benign year. 2005 would have seen no restrictions at all (nor were there any in the first half year) and was a moderately bad year. 2007 saw moderate restrictions on average but was one of the two driest years. And 2008 was moderate restriction-wise but one of the wettest, flow-wise.

Summary: The algorithm did not work well in six of the nine years in the July 1-July 27 interval. Succeeding one third of the time is no better than random chance. The net result is that the proposed algorithm simply doesn't work for this interval.

The following examines the July 27-August 12 trigger period.

Year	July 27 Discharge	Action?	Action before next trigger?
2000	305	80%	55%(8/6)
2001	13	min	min
2002	18	30%	30%
2003	134	55%	55%
2004	169	80%	55%(7/31)
2005	138	55%	30%(7/30)
2006	139	55%	55%
2007	17	30%	30%
2008	441	80%	80%

At this point, we have already entered the dry period. 2001 and 2007, the driest years, have the strongest restrictions applied, while 2005, one of the three next driest years, have moderate restrictions. 2003, 2004, 2006, and 2008, the four least dry years, have the loosest restrictions. Only 2000, an intermediate year dryness-wise with loose restrictions, and 2002, an intermediate dryness year with strong restrictions, fall off the curve. However, in 2000 the dry period came late, in September. Which illustrates the most significant point proven by the above data: *You only know you will have a dry spell when you are already in it.* In other words, the whole notion of anticipating dry spells with flow triggers to compensate for lack of knowledge of groundwater flow time does not work.

A close examination of 2005, a moderately dry year in this group, is instructive. This is the daily data for the year through October:

Daily Mean Discharge, cubic feet per second (DD 01)										
DATE	Jan 2005	Feb 2005	Mar 2005	Apr 2005	May 2005	Jun 2005	Jul 2005	Aug 2005	Sep 2005	Oct 2005
1	321 ^A	221 ^e _A	391 _A	779 _A	407 _A	480 _A	257 _A	17 ^A	18 ^A	18 ^A
2	319 ^A	207 ^e _A	408 _A	804 _A	391 _A	451 _A	199 _A	26 ^A	14 ^A	15 ^A
3	320 ^A	210 ^e _A	400 _A	943 _A	416 _A	417 _A	189 _A	20 ^A	13 ^A	15 ^A
4	399 ^A	200 ^e _A	349 _A	931 _A	446 _A	374 _A	184 _A	16 ^A	12 ^A	14 ^A

5	389 ^A	200 ^e _A	252 _A	856 _A	458 _A	356 _A	170 _A	22 ^A	12 ^A	13 ^A
6	397 ^A	200 ^e _A	245 _A	792 _A	452 _A	342 _A	261 _A	20 ^A	12 ^A	13 ^A
7	401 ^A	200 ^e _A	255 _A	812 _A	491 _A	338 _A	284 _A	14 ^A	12 ^A	13 ^A
8	390 ^A	200 ^e _A	314 _A	803 _A	528 _A	342 _A	312 _A	13 ^A	11 ^A	51 ^A
9	390 ^A	181 ^A	329 _A	794 _A	524 _A	434 _A	470 _A	12 ^A	10 ^A	287 ^A
10	346 ^A	241 ^A	295 _A	747 _A	529 _A	396 _A	382 _A	13 ^A	9.7 _A	164 ^A
11	285 ^A	308 ^A	235 _A	661 _A	506 _A	379 _A	369 _A	12 ^A	9.5 _A	214 ^A
12	306 ^A	281 ^A	227 _A	572 _A	480 _A	369 _A	393 _A	10 ^A	9.9 _A	368 ^A
13	388 ^A	268 ^A	229 _A	521 _A	443 _A	362 _A	391 _A	10 ^A	9.0 _A	444 ^A
14	500 ^e _A	251 ^A	224 _A	455 _A	410 _A	353 _A	360 _A	32 ^A	12 ^A	460 ^A
15	650 ^e _A	380 ^A	242 _A	378 _A	403 _A	351 _A	310 _A	92 ^A	186 _A	1,330 ^A
16	580 ^e _A	445 ^A	245 _A	291 _A	403 _A	346 _A	299 _A	44 ^A	219 _A	1,380 ^A
17	540 ^e _A	532 ^A	245 _A	268 _A	350 _A	360 _A	293 _A	35 ^A	188 _A	1,190 ^A
18	500 ^e _A	531 ^A	245 _A	251 _A	317 _A	346 _A	290 _A	30 ^A	185 _A	1,040 ^A
19	470 ^e _A	482 ^A	247 _A	248 _A	315 _A	338 _A	276 _A	26 ^A	139 _A	922 ^A
20	440 ^e _A	437 ^A	247 _A	254 _A	306 _A	338 _A	254 _A	22 ^A	39 ^A	851 ^A
21	400 ^e _A	409 ^A	252 _A	262 _A	302 _A	332 _A	231 _A	21 ^A	27 ^A	836 ^A
22	370 ^e _A	375 ^A	258 _A	263 _A	306 _A	308 _A	213 _A	18 ^A	21 ^A	678 ^A
23	334 ^e _A	320 ^A	267 _A	280 _A	288 _A	298 _A	193 _A	15 ^A	18 ^A	643 ^A

24	319 ^e A	312 ^A	272 ^A	404 ^A	314 ^A	289 ^A	188 ^A	15 ^A	16 ^A	546 ^A
25	290 ^e A	293 ^A	267 ^A	415 ^A	437 ^A	283 ^A	190 ^A	15 ^A	16 ^A	788 ^A
26	280 ^e A	254 ^A	269 ^A	431 ^A	671 ^A	278 ^A	168 ^A	13 ^A	16 ^A	1,040 ^A
27	265 ^e A	244 ^A	267 ^A	448 ^A	671 ^A	271 ^A	138 ^A	13 ^A	20 ^A	981 ^A
28	258 ^e A	274 ^A	410 ^A	491 ^A	637 ^A	256 ^A	62 ^A	13 ^A	15 ^A	936 ^A
29	253 ^e A		776 ^A	431 ^A	598 ^A	261 ^A	37 ^A	17 ^A	27 ^A	842 ^A
30	250 ^e A		798 ^A	368 ^A	550 ^A	266 ^A	21 ^A	16 ^A	36 ^A	792 ^A
31	240 ^e A		786 ^A		510 ^A		17 ^A	17 ^A		670 ^A
COUNT	31	28	31	30	31	30	31	31	30	31
MAX	650	532	798	943	671	480	470	92	219	1,380
MIN	240	181	224	248	288	256	17	10	9.0	13

Note that this is quite a wet year right up until July 28, when flow drops under 100 cfs for the first time. It then plunges in three days to 17; twelve days later it declines to 10, nearly the lowest of the year. It remains low, with some wetter intervals, until early October, when it suddenly recovers. By mid October the river is flooding.

No possible trigger scheme could have mitigated the impact of withdrawals on the low flow of August 12 unless the lag time from action to effect at the river is less than two weeks, as this was an exceptionally wet year until two weeks before the event. Since this is highly unlikely, the proposed operational management scheme will not work, and the proposed well withdrawals will have a direct and adverse impact on the river.

The DEIR Certificate states "And in particular, The FEIR should assess the time delay of pumping alterations on streamflow in order to design an appropriate mitigation plan to avoid impacts during the months of July through October, which are typically the driest." I wholeheartedly agree that a knowledge of the time delay is necessary to design any effective mitigation plan. The failure to meet this requirement of the Certificate is no mere technicality, but fatal to the central goal of the document.

Project Economics

The only way to avoid the effect on the river is through extensive pump testing that will determine the actual lag time; any attempts to address the issue with modeling alone will fail because models need parameters to produce meaningful results. Those parameters are precisely what would be determined by testing. However, once the lag time is determined, a negative effect on streamflow can be avoided by turning the wells off for a four month period every year. If, for example, the lag time turns out to be six months, then the wells can be turned off from January through April to maintain flow to the river from July through October.

Such a strategy, however, begs the question of whether the project still works economically with pumping restricted to only two thirds of the year, especially given that the rate has already been reduced to avoid the issues under the Interbasin Transfer Act. The proponent should repeat the financial analysis assuming such a new operational regime.

IBTA

Again, I will comment that the clear language of the IBTA, requiring permitting if "new facilities" are required, is contrary to the conclusions in the Certificate that a portion of the originally proposed reactivation is grandfathered. If this project proceeds to permitting then this conclusion should be challenged in court.

Conclusion

As a result of the failure of the proposed mitigation scheme as shown above, it should be clear that this document does not satisfy the requirements for the FEIR, and the proponent should respond to the issues raised in a supplemental EIR.

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