To: Conservation Commission
cc: Marnie Crouch, Planning Board Chair
Mark Connors, Planning Director
From: Anne Gero
Date: November 20, 2024
Re: Softball Field Improvement Project – Proposed Date for Testing of Artificial Turf Components

I am writing to request that the Conservation Commission require the School District to have the artificial turf for the softball field tested well in advance of May 2025 proposed installation date. The Orders of Condition for the softball field improvement project require that all components of the artificial turf be tested "prior to commencement of any work on-site". Several months ago, the School District informed the Commission that the artificial turf for the softball field would not be delivered to the project site until May 2025, and that it would be tested for PFAS and installed at that time.

The proposed testing schedule affords the Conservation Commission little or no time to review the test results, especially with the turnaround time for PFAS test results that the School District has experienced to date. A stockpile site for the artificial turf already has been approved by the Commission. There is no reason why the artificial turf cannot be delivered to the site and tested well before the May 2025 installation date.

Given the PFAS contamination already existing in the wetlands, any new PFAS added to the wetlands or groundwater presents a complicated situation. As we know, PFAS bioaccumulate, and any new PFAS will be additive to those already existing. If the test results show any PFAS in the artificial turf, the Commission will have to consider the total impact of the existing and new PFAS on the wetlands and groundwater.

The School District has argued that the Orders of Conditions only require the School District to test the artificial turf, without being subject to any further conditions or action based on the results of those tests. Thus, it is taking the position that the Orders of Condition allow it to proceed with the installation of the artificial turf regardless of the test results. Yet, this is not a reasonable or correct reading of the Orders of Conditions. If the Commission were not able to take any action or impose any additional conditions based on test results, then the required testing would be irrelevant and would serve no purpose. This could not be the case.

If the Commission is to appropriately enforce the Order of Conditions and protect the resource values implicated by this project, it should require the School District to test the artificial turf on a timeframe that allows the Commission to appropriately review the test results and consider their impact given the existing conditions. That is precisely why the Orders of Condition required that the testing be performed "prior to commencement of any work". The School District should not be allowed to control the timing of the testing such that the Commission is constrained in its ability to protect the resource area values.

Existing PFAS Conditions
Any PFAS in the artificial turf will have to be considered in light of the existing conditions. I therefore have summarized the test results from the second round[1] of baseline testing for PFAS in the adjacent wetlands as follows:

[1] The first round of testing was inadequate in that it tested only 2 of the 4 locations, and did not test for all of the required compounds or for total fluorine. As a result, the School District performed a second round of testing.

Specific compound – EPA Method 1633 (ppt)	Location 1	Location 2	Location 3 (on Clark property)	Location 4 (on Clark property)
PFBS	4.33	3.93	2.18	1.98
PFHpA	6.48	5.93	2.57	2.12
PFHxS	3.60	2.93	ND	ND
PFOA	24.0	20.8	10.2	8.77
PFNA	5.54	5.44	1.83	1.75
PFOS	49.1	78.7	18.1	20.07
PFDA	ND	ND	ND	ND
PHPO-DA	ND	ND	ND	ND
PFAS6	88.7	114	32.7	33.3
Total Fluorine (AOF) – EPA Method 1621 (ug/l or ppb)				
Adsorbable organic fluorine	2.4	2.6	ND	2.4

The above results show elevated levels of several individual PFAS compounds at all of the locations. In addition, the results show adsorbable organic fluorine (AOF) at 2.4 to 2.6 ppb at three of the locations[2]. This is equal to 2,400 – 2,600 ppt of organic fluorine. Given that the individual PFAS compounds total approximately 120 ppt at their highest location (ie., Location 2), this means that there is a substantial amount of potential PFAS at this location that have not been characterized by the testing done to date. While some of this AOF may be due to the presence of other organic fluorines that can be found in pesticides or pharmaceuticals,[3] the School District could provide pesticide and pharmaceutical testing to determine what portion may be attributable to them.

Aquatic Life Standards

The test results also show levels of PFAS in the surface waters of the wetlands that may be detrimental to aquatic life.

In September 2024, EPA published surface water criteria for PFOA and PFOS for the protection of aquatic life[4]. It established these criteria for both "acute exposure" and "chronic exposure" which are defined by EPA as follows:

acute exposure:	1-hour average duration not to be exceeded more than once in 3 years, on average
chronic exposure:	4-day average duration, not to be exceeded more than once in 3 years, on average

Given these definitions, it appears that the duration of the PFAS existing in the wetlands greatly exceeds the definition of chronic exposure. We know that elevated levels of PFOA and PFOS were present in the initial

[2] Per the test report, Location 3 has a non-detect for AOF. The lab has a reporting limit of 2.0 ug/l for this test. Thus, if Location 3 has a PFAS concentration slightly below 2.0 ug/l it will show as a non-detect.

[3] Pesticides may well have been applied to the softball field in the past. As for pharmaceuticals, there are several septic systems upgradient of Location 2, including the septic system that serves the School. Query, however, why pharmaceutical compounds being discharged via leaching fields would be found in surface waters at these point (vs moving more deeply in the groundwater)?

[4] See EPA Fact Sheet, Final Recommended Aquatic Life Criteria and Benchmarks for Select PFAS (September 2024).

round of baseline testing with samples taken on 6/3/24, as well as in the second round of baseline testing with samples taken on 9/23/24. Thus, we have evidence of exposure of 112 days at a minimum, with the possibility of the exposure being quite a bit longer.

The EPA limits for chronic exposure are as follows:

PFOA	.10 mg/l
PFOS	.00025 mg/l

In the baseline test results, the highest PFAS concentration is for PFOS at Location 2 where it was 78.7 ppt. The EPA standard of .00025 is equal to 250 ppt.[5] Because PFAS are additive, it would take only 171.3 ppt of additional PFOS at this location (and 230 ppt at location 4 which is the pond on the Clark property) to violate the EPA aquatic life criteria for chronic exposure.

With respect to these EPA criteria, it is important to take into account that (1) the duration of exposure for aquatic life in the wetlands adjacent to the softball field is much more than the 4 days that form the basis of the EPA "chronic exposure" standard, and (2) there are a significant number of other PFAS compounds present in the wetlands that could have an additive effect. This raises an issue for the Commission regarding whether allowing additional PFAS to contaminate the wetlands and groundwater via the artificial turf is appropriate under the bylaws.

[5] .00025 mg/l is .00025 milligrams per liter. This is the same as .25 micrograms per liter, or 250 nanograms per liter, or 250 ppt.

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December 11, 2024

Hamilton Conservation Commission
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Re: Hamilton Wenham Softball Field Renovation Project – Test Results

Dear Commissioners:

I have reviewed the various test results and certifications (the "Test Results") that Gale Associates ("Gale") has provided to date to the Commission and would like to share my initial thoughts on them as follows:

Baseline Testing of Wetlands

Gale has provided test results for the baseline testing of PFAS in the wetlands as required by the existing Orders of Conditions for the softball field renovation (the "Orders"). Those tests were for several specific PFAS analytes as well as for total fluorine. My review of those test results is set forth in memorandum that I submitted to the Commission dated November 20, 2024.

Since the date of my memorandum, it has come to my attention that Gale has submitted a second set of data for total organic fluorine in connection with the baseline testing. This second data set used the same water samples, and both used EPA Method 1621. However, the first set of data (analyzed 10/2//24) is reported as "Combined Combustion" and the second set of data (analyzed 10/17/24) is reported as "Single Combustion". The results from these two data sets are different as follows:

Sample	"Combined Combustion"	"Single Combustion"
1 – upstream of the softball field drainage	2.4 ppb	ND[1] at 2.0 ppb
2 – adjacent to the softball field drainage	2.6 ppb	2.4 ppb
3 – on Clark property approximately halfway to the Miles River	ND at 2.0 ppb	ND at 2.0 ppb
4 – on Clark property near Miles River	2.4 ppb	3.2 ppb

Gale should request an explanation from the lab of the differences between the "combined" vs. "single" combustion tests, and the advantages/disadvantages of using one over the other for the testing of PFAS in surface water samples.

PFAS Testing of Field Components

1. Laboratory to be Engaged by Applicant
   The Orders state that the "applicant" must engage an independent testing laboratory to perform the testing. In connection with the Test Results, it appears that most of this testing was ordered by the

[1] ND means "non-detect".

manufacturer who then received the results and forwarded them to Gale. This is not what was contemplated by the Orders.

At the last meeting of the Commission, Mr. Rowan stated that the Test Results were from samples taken from "the same batch" as the materials that will be delivered to the site next spring for the softball field. Yet, there is no statement from the manufacturers or any indication in the test reports regarding what "batch" was being sampled. In fact, some of the lab reports state that they received samples without chains of custody or any sample dates or times.

At a minimum, the Commission should require a statement from the manufacturers that the samples tested are from the same batch as the materials that will be installed at the softball field.

2. Not All Components Tested

It appears that not all of the components that will be installed at the softball field have been tested. In particular, it appears that the brown "dirt" looking material that will be used for the infield, the baselines, and perhaps the batting cage surface, etc. has not been tested.

In addition, the Test Results include testing for a Sprinturf "sand infill". I was not aware that Sprinturf would be providing any sand infill. Instead, I thought that the infill would consist entirely of Brockfill.

It would be helpful if Gale could provide a list of the various components of the softball field surface and its drainage system so that we can be assured that all applicable components have been tested. With respect to the infield surface material, Gale also should provide a description of the composition of the material, the name of the manufacturer, and how it will be installed.

3. Reporting Limits/Dilution Factors

Several of the tests appear to use inappropriate reporting limits or dilution factors. Specifically:

a. 2024 Brock Organic Infill – Amended Report

This is a total organic fluorine test on the Brockfill that was performed by a Eurofins lab in Norwood, MA. This report used 100 mg/kg (ppm) as the reporting limit based on the "Client's Requirement" and reported no fluorine at that limit. Yet, the lab reporting limit for this test is actually 10 mg/kg (ppm), as explained in the footnote to the lab result table. Furthermore, the Eurofins US website states that for total fluorine testing "achievable detection limits are in the ppb".

b. 2024 Brock Shock Pad - Amended Report

This is a total organic fluorine test on the Brock shock pad that was performed by the Eurofins lab in Norwood, MA. It has the same reporting limit as the test report for the Brock infill, and I have the same issues with it as noted above for the Brock infill test report.

c. 2024 Sprinturf Total Fluorine Test

This is a total fluorine test performed by RTI Laboratories using a different method than performed by the Eurofins lab. RTI reported the result as "< 160" mg/kg (ppm) which presumably means that total fluorine was not detected at a reporting limit of 160 mg/kg (ppm). This reporting limit, however, is well above the 10 ppm of the Eurofins Norwood lab, and well above the ppb detection limit that Eurofins US has advertised as being achievable for total fluorine testing.

This test report also states that it utilized a "dilution factor" of 5. No explanation is given for this dilution factor, and the Eurofins total fluorine tests for the Brock products did not report a dilution factor. This should be explained.

4. Incomplete Reports

Several of the reports contain no case narrative, quality control data, or chain of custody for the samples analyzed.

Thank you for your consideration of my comments.

Respectfully,

Anne Gero

Cc: Mark Connors, Director of Planning

Technical assistance provided pro bono by:
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Anne L Gero
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January 15, 2025

Hamilton Conservation Commission
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Re: Hamilton Wenham Softball Field Renovation Project – PFAS Test Results

Dear Commissioners:

By letter to you dated December 11, 2024, I pointed out several deficiencies in the PFAS test results for the artificial turf components that were submitted to you by Gale Associates ("Gale"). Since then, two more deficiencies have come to my attention. They are as follows:

1. Testing by Applied Technical Services ("ATS") dated 8/28/24
   ATS appears to have tested the blade component of the artificial turf and reported (a) no PFOA or PFOS at reporting limits of 100 ppt, and (b) a lack of 16 other PFAS compounds at reporting limits of 10 ppb. Yet, the analytical test ATS used was EPA 8321B which is not an EPA test for PFAS compounds.

   The well accepted method for analyzing these PFAS compounds is EPA 1633. This method was finalized by the EPA on January 31, 2024. All of the test results submitted by Gale for specific PFAS compounds performed after this date used EPA 1633 except for ATS. Despite this, Gale provided only the bare results without any accompanying narrative, quality control data, or explanation of how/why this test was used rather than EPA 1633. Because of this, the ATS results should be rejected.

2. Other Necessary Testing
   The Orders of Condition for this project provide that the School District must use "best available methodology" for its PFAS testing. Based on this standard, the School District also should be providing Synthetic Precipitation Leaching Procedure ("SPLP") testing as well as Total Oxidizable Precursor ("TOP") assay testing. These tests would help to show how much PFAS and their precursors may leach from the artificial turf components.

Thank you for your consideration.

Sincerely,

Anne Gero