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Re: Independent Observer Report for Jabez Branch: February 2025-November 2025

To Whom It May Concern:

This document serves as a report of my activities during 2025 as an Independent Observer of the Stream Monitoring Activities on Jabez Branch undertaken by Maryland Department of Natural Resources as part of a stream restoration effort.

Qualifications:

I hold PhD in Aquatic Ecology (2002) and an MS in Forest Ecology (1996) both from the University of Michigan, Ann Arbor. I have more than 28 years of field experience sampling and measuring streams and analyzing ecological data. Since 2008, I have been a Professor of Geography & Environmental Systems at UMBC. Prior to that I was an Assistant Professor of Watershed Sciences at Utah State University and a Research Ecologist at the Smithsonian Environmental Research Center. I have served as expert witness in federal and circuit court cases dealing with degradation and restoration of aquatic habitat and held appointments as a Research Professor with the USGS and as a Maryland Fellow with the National Socio- Ecological Research Center. I currently serve as a member of the Science and Technology Advisory Committee (STAC) to the Chesapeake Bay Program.

Spring Sampling Observation:

On April 10th, 2025 I joined a MBSS sampling crew to observe their efforts in sampling macroinvertebrates from Jabez Branch and the Jabez III restoration during the spring index period. The site visit corresponded to the season in which streams were likely to have the most robust aquatic insect populations at their largest larval instars and thus provide easier identification for a more precise diagnostic assessment.

I followed the crew as they delineated both sampling reaches on Jabez Branch mainstem and observed the crew leader as he assessed local habitat conditions in each reach. I performed my own assessment in the upstream reach and was able to observe how my scores aligned with his (they showed substantial agreement, as would normally be expected). I also observed their implementation of standard MBSS field procedures for collection of macroinvertebrates in the best available habitat.

The staff on site consisted of some long-term field personnel as well as relatively new employees and interns. They had arrived on site having sampled many other locations during the index period as a well-organized, efficient crew. They were focused in their efforts and paid fastidious attention to their procedures in a relaxed way that comes from long experience. The more experienced crew members supported and assisted the less experienced staff. Having followed the MBSS protocols in the past as well as those from other states in the mid-Atlantic and Midwest, I was impressed with their professional conduct and had no concerns about their sampling approach or their handling of the samples.

Summer Sampling Observation:

On September 8th and 10th, 2025 I joined the fish sampling crew to observe their approach to sampling the Jabez mainstem followed by the restoration reach. Like my experience with the macroinvertebrate crew, the fish sampling staff were a mix of experienced biologists and seasonal staff/interns. They had also been sampling for some time, and together they worked thoroughly and efficiently. There was no rush, as there was always time to keep team members safe, to resolve a tricky identification, or to address a question so that everyone was on the same page, but there was little wasted time. The techniques they employed were sound, well-established approaches to sampling and recording data. Overall, my impression was that the field crew was doing their job as expected, consistent with MBSS protocols.

Two days later I joined the same group for the effort to sample the restoration reach. Due to the width and configuration of the channel, this was an “all hands-on deck” exercise, where many members of the MDNR Resource Assessment Service staff were recruited to help with blocking the reach, electrofishing, as well as collecting and processing the samples. As with macroinvertebrates, sampling protocols developed for single or multithread channels do not always work so well in extensive wetland environments, so I was curious to observe their approach and how interpretations had changed since I first employed it in similar environments in 2003. Also, due to an injury to one of the staff members, there was a shortage of hands for some of the widest parts of the reach. I was asked to participate in the sampling as supporting personnel, and I willingly agreed. As far as I know, because I couldn’t stay for the entire day, I was the only crew member to fall into a hole during sampling.

In general, the restoration reach is a challenging one to sample. The terrain is level and the water mostly shallow but filled with downed wood and low shrubs in addition to fine sediment and floc filling depressions, making footing uncertain, limiting subaqueous visibility, and challenging the use of block nets. At any time, there were more than 10 staff working simultaneously to collect and process fish. The crew was highly professional and thorough, despite the relatively monotonous task of enumeration of mosquitofish, which exhibited a marked increase in abundance since the prior seasons sampling.

Data Handling:

On November 3rd, 2025, I met with DNR staff to discuss the water quality data being collected by sondes and field sampling and strategies for cleaning and preparing the data in the most objective and transparent manner. To be clear, the staff involved in these discussions are all qualified professionals, but they were meeting with me to ensure that their approach met the highest standards of integrity and consistency regarding program objectives. In particular, the discussion centered around approaches for identifying questionable and unreliable readings, the handling of these data, and how best to communicate the steps used to identify the most reliable information for inference. At the end of this discussion, we agreed that I would review their initial data handling procedures and we would reconvene for another meeting.

Subsequently, I reviewed materials sent to me on November 4th, and we met again on November 5th. Most of our discussions centered around procedures for determining when iron floc collecting on the sondes was sufficient to make sensor readings unreliable. We discussed using multiple indicators in the results of different sensors and learning from USGS monitoring procedures in similar environments. We also discussed how the physical location of certain sondes could be influencing their measurements. At the end of this meeting, I felt that we agreed that DNR had arrived at a reasonable and feasible data handling strategy.

About a week later, I received a draft version of the data from DNR staff for my initial review. In my capacity as an independent observer, my role was not to evaluate or interpret the ecological meaning of the data, but to assess whether the data being collected by DNR monitoring efforts was reliable and a reasonable representation of site conditions. I spent several hours reviewing the data and how handling procedures were affecting the reporting. At the end, I was satisfied that DNR procedures were effective at presenting the monitoring results in a fair and straightforward manner.

Monitoring Concerns:

Thus far, I perceive several key conceptual and logistical hurdles facing the ongoing monitoring and assessment of Jabez Branch III. First, reconfiguration of the channel into a series of slow moving and shifting wetland environments poses a substantial challenge for continuous water quality monitoring at the site. Sonde placement can and is having a significant effect on the conditions being captured by environmental sensors. If the stations are located in relative static or slow-moving environments, they will necessarily reflect greater temperature variation, less mixing, lower oxygen concentrations, and less frequent natural removal of floc from the sensors themselves. On the other hand, sondes placed to capture relatively rapid flow where there are signs of current will likely show greater mixing, dampened flux, and water quality patterns more consistent with a flowing water environment. However, these locations and their conditions are relatively localized not necessarily broadly representative of the habitats created by the reconfiguration. Moreover, dewatering of sensors due to shifting patterns of flow is a concern, and nearly any sonde location placed in deeper spots to avoid

dewatering is less likely to capture representative conditions relevant to assessing the success of the restoration effort.

Second, iron flux remains a logistical challenge in maintaining the sondes and both the condition and the quality of resulting data. DNR staff are acutely aware of these issues and have developed a reasonable strategy for maintaining sondes over time with relatively limited periods of downtime. Nonetheless, the accumulation of floc will likely pose an ongoing factor related to data quality. There has also been discussion and consideration of developing both qualitative and quantitative characterizations of the degree of iron floc accumulation, as these dynamics are not only of concern for monitoring efforts, but also likely pose a significant habitat consideration.

Third, biotic assessment of aquatic condition within the MBSS is primarily achieved using biotic indices (e.g., fish and benthic IBIs). These metrics are well established and reliable measures of overall stream conditions with several important caveats: (1) they are known to be relatively noisy and occasionally insensitive to moderate *changes* in conditions over short periods of time and (2) they are general indicators not specifically designed for shallow water wetland habitats. Therefore, care should be taken in using results of biotic assessments within the restoration reach itself to derive conclusions about the state of that system and its changes through time.

Finally, the DNR sampling design is well considered, focusing on sampling physiochemical and biological conditions and their variation within the reconfigured extent as well as both upstream and downstream of the restoration. Critically, there is also an effort to capture conditions upstream and downstream of the confluence on Jabez Branch itself. It seems apparent that the distribution of sampling effort reflects two underlying questions: how has the reconfiguration of the channel and water flow affect conditions *within* the restoration reach, and how the restoration effort has impacted conditions in Jabez Brach more broadly. My sense is that biological sampling effort and interpretation is best allocated to the second question, whereas physiochemical effort is essential for both, and might even be expanded within the restoration to better understand how internal conditions contribute to the net effect observed downstream.

Synthesis:

The Jabez site has posed significant monitoring challenges for DNR staff and equipment in the early stages of project monitoring. However, the staff have responded admirably and diligently to the difficulties, and their data is generally effective at capturing site conditions. Initial challenges may have stemmed from monitoring while the system was still in flux, but the effort has provided opportunity to adjust to site challenges, reassess and revise the approach. As the system has stabilized, the monitoring team has developed a clearer idea of how to capture and represent site conditions. It is my view that efforts are currently adequate but might yet benefit from augmented physiochemical characterization within the restored section of Jabez III.

Submitted Respectfully,

Matthew Baker
Professor