

QUITTAPAHILLA WATERSHED ASSOCIATION
Meeting Minutes
Annville Town Hall and Remotely Via Zoom (Hybrid Meeting)
Tuesday, September 17, 2024

Present: Michael Schroeder (President), Joseph Beidler, Alexis Biondi, Willie Bixler, Bob Connell, Joseph Connor, Karen Feather, Katie Hollen (LCCD), Kara Lubold (LCCD), Rick O’Leary

The meeting opened at 7:01 p.m.

1. Minutes. The minutes of the August 20 meeting were circulated electronically before the meeting and approved by consensus.

2. Monitoring Program Updates

A. Equipment Update

- 1) ISCO Auto-Samplers.** Kara reported that she & Bob met at Kara’s garage last Tuesday to assess and test the equipment. The batteries were dead and replaced with a motorcycle battery; now they seem to work. They were tested in the garage; the next step is to test them in the field. The goal is to have them ready to deploy by next spring. Bob reported that he is very pleased with the state of the equipment and expects them to be fully operational. Katie and Kara know how to program them for water sampling.
- 2) Multiparameter Sonde Repair.** Mike and Katie reported that the handheld device for the multiparameter sonde was sent back to the manufacturer for repair (the problem was a blank screen). It was still under warranty, fixed, and sent back to us and now seems to be working well.
- 3) Hobo Data Loggers.** Bob and Willie reported that the Hobo data logger at Beck Creek is working; that Willie checked the one at Snitz Creek and it had recorded no data so he replaced the battery but it still didn’t seem to be recording any data. Bob suggested it must be a problem with the sensor. Bob and Willie will look into it.
- 4) Pygmy Meter vs. Digital Flow Probe vs. USGS Gage Station.** Mike & Bob & Katie reported on fieldwork undertaken to determine the relative accuracy of two ways of measuring streamflow: with the pygmy meter (using the headset to count the number of clicks / minute) and the digital flow probe that came with the ISCO auto-samplers. We compared them to each other and to the USGS gage station at Palmyra-Bellegrove Rd on the lower Quittie mainstem. The results are very encouraging and appear in **Appendix 1** to these minutes.

- B. Upcoming October Fieldwork.** Katie has scheduled the following two dates for our next round of monitoring fieldwork: Wed Oct 16 at Q1, Q2, K1, and Wed Oct 23 at S1, BK1, BM1. In both cases, Katie and a team will meet at 8 am at LVC to pick up and calibrate the equipment, and expect to be in the field 9 am, with volunteers needed to take samples to DEP lab in Harrisburg.
- C. Data Management & Interpretation.** Bob, Katie, Mike, and Kara summarized the past month's developments with respect to data management & interpretation. A series of emails reporting on these developments are included below in **Appendix 1** to these minutes.
- 3. Projects update.** See the Watershed Action Team meeting minutes of September 5, 2024 in **Appendix 2** to these minutes.
- 4. Grant opportunity.** Mike reported that action on the grant opportunity reported on last month is still pending (from the Aug. 20 minutes: "Mike and Courtney Reimann, Land Protection Director at The Lebanon Valley Conservancy (TLVC) have been in conversation about the Stream & Watershed Enhancement Grant Program offered by the Susquehanna River Basin Commission (SRBC), which closes Oct. 31: <https://www.srbc.gov/our-work/grants/stream-watershed-enhancement-grant.html>. He reported that they expect to focus on signage for the watershed; one example of interpretive signage is here: <https://www.gallatinwatershedcouncil.org/watershedsignage> Joseph volunteered to help with designing signage").
- 5. First countywide strategizing meeting.** Mike reported on the first strategizing meeting of local actors in the watershed on Friday Sept. 6 at the LCDC office on Cornwall Rd. The list of invited participants and meeting agenda appear below in **Appendix 3** to these minutes, along with a document prepared by Rocky Powell as background information for meeting participants, titled "A Brief History of Quittapahilla Creek Watershed Restoration Efforts." The minutes of the Sept. 6 meeting were still being drafted at the time of this Sept. 17 QWA meeting, but overall it was a very productive meeting that made substantial progress in developing a roadmap for collaboration moving forward.
- 6. Upcoming Special Events.**
- A. Saturday, Nov. 16.** Katie reported that the Lancaster-Lebanon Watershed Forum is scheduled for Saturday, November 16, at the Middle Creek Wildlife Management Area.

- B. Jan. 4-11, 2025.** Alexis suggested that the QWA be represented at the PA Farm Show, perhaps with a demonstration of the utility of streambank fencing for livestock. Alexis said she would look into it and report back.

The meeting adjourned at 7:46 pm.

Respectfully submitted,

Michael Schroeder, Secretary Pro Tem

Appendix 1. Emails among QWA Members on the Monitoring Program & Data Management, Aug. 20—Sept. 17, 2024

from: Bob Connell
to: Michael Schroeder
date: Aug 19, 2024, 7:12 PM
subject: Re: QWA monthly meeting 7pm Tues Aug 20 in-person & Zoom

I don't have any updates on the Hobo loggers yet. I will try to have that for the September meeting. All are working other than Beck Creek. I have downloaded the most recent data from the working loggers and will load that into our data portal by this time next week. I was interested to hear of the QWA website move to GoDaddy. GoDaddy has the ability to host a MySQL database, so that raises the potential of putting our data portal on the same server as the web page. It would be good to have it all in one place. Maybe we can meet over the next few weeks and see if we can make that happen.

Also, I developed an app for the phone or tablet to handle our field measurements from the sonde. Katie tried it earlier this month and I think it worked well for her. Using the same software, I made a similar app to handle our flow measurements in the field. I just sent Katie a message about it. We can try it out next week when we're in the field. Both apps save the data to Google Drive as we enter it. I'm hopeful that this will help us to streamline our field work.

from: Bob Connell
to: Kent Crawford

cc: Michael Schroeder, Katie Hollen, Gary Zelinske
date: Aug 27, 2024, 8:08 PM
subject: Evaluation of digital velocity meter

Hi Kent,

Attached are the results of the evaluation of the digital velocity meter that Katie arranged for today. Let us know what you think of these results. The best I can summarize is:

Pygmy meter reading vs USGS real-time flow = -3% difference (lower)

Average digital meter reading vs USGS real-time flow = 11% difference (higher)

Coefficient of variation among the three digital meter readings (at 3 different transects) = 2.3%

So the digital meter readings were consistent, but differed from the USGS reading by more than 10%.

Bob

Kent Crawford
Thu, Aug 29, 2:26 PM
to Kara, Karen, Alyssa, Bob, Mike, Katie, Gary
Re: Evaluation of digital velocity meter

Thanks for doing this test.

I must begin by stressing the importance of having streamflow measurements that accompany our water-quality samples, so your work is critically important.

Remember, for some constituents, especially sediment and anything that adsorbs to sediment (for example total phosphorus, metals), concentrations in the water increase with increasing streamflow. This is logical. High water equals muddy water. The water is muddy because of the sediment. The sediment carries attached contaminants.

But for other constituents, particularly those constituents dissolved in the water, high flow results in a lower concentration in the water. A good example of this for the Quittapahilla Creek Watershed would be calcium. Much of the underlying rock in the watershed is limestone (calcium carbonate or CaCO_3). So during low flow, the water in the creek is primarily groundwater that has come to the surface through seeps and springs. This groundwater has been in contact with the underlying rock and the limestone there has dissolved causing high calcium concentrations. But during high flow, rainwater which is very dilute (almost pure) comprises a larger part of the stream flow. The rainwater dilutes the calcium so high flow means lower concentrations. Another example would be contaminants in wastewater treatment plant (WWTP) effluent. The outflow from the WWTP is somewhat constant. Rainwater that runs off into the creek would dilute the contaminants coming from the WWTP.

So, if we want to determine changes in water quality over time, we have to know if the water volume has changed over time. Another example -- So far, all our sampling has been at low flow. But now, we have the ability to collect high-flow samples using our ISCO automatic samplers. If we were to go ahead and collect some high-flow samples and then look at a trend line over the past two years, we might incorrectly conclude that total suspended solids (sediment) is increasing.

If you have read this far, thank you for being serious about this whole effort.

The pygmy current meter performed better than I expected. In the USGS, we believe that our streamflow measurements using the Pygmy are accurate within 5%. And, that is using 20 measuring points across the stream instead of our (QWA) protocol which calls for only 10 measuring points. So, very good. But, what were the conditions like for the pygmy meter measurement? Were there any low-velocity sections? You will recall that our concerns revolve primarily around low-velocity accuracy. On the other hand, what if we are getting poor readings at low velocity? The low-velocity segments likely make up a very small portion of the total streamflow for any location. So perhaps, inaccuracy for the low-velocity segments is minimal and can be overlooked.

For the digital meter, the 11% difference compared to the USGS reading is larger than desirable, but not too, too unbearable. And, the consistency is great.

Using the digital meter seems to be less accurate. Using the pygmy meter takes longer. So, are we willing to sacrifice accuracy for convenience? I think this is a decision for the entire group to address. Let's take it up at the next QWA meeting.

Here is my recommendation. We are a volunteer effort. Even so, we are doing good work. Our samples are collected using DEP protocols. Our lab analyses are done by a NELAP-certified lab. We have passed a field audit of our work. Our quality-control samples (blanks and replicates) have been within allowances. All good. But, we are a volunteer effort. I doubt that many volunteer monitoring programs are collecting streamflow measurements at all. Therefore, to give our field crews a bit of a break, I suggest we can accept a minimal deviation in streamflow accuracy and use the digital meter for future streamflow measurements. We can talk about it at the meeting.

Again, our thanks to the crew who did the field tests.

Kent

Dr. J. Kent Crawford
Environmental Scientist
Hummelstown, PA

from: Bob Connell
to: Michael Schroeder, Katie Hollen, Kent Crawford, Kara Lubold, Gary Zelinske, Alyssa Bellucci
date: Sep 5, 2024, 8:28 PM
subject: An example of how useful our water quality data can be

Hi everyone,

All the great data that we've been getting on water quality was calling out to me saying "do something to show us off". So the attached is one example of how our data can be used. Hope you find it interesting.

Bob

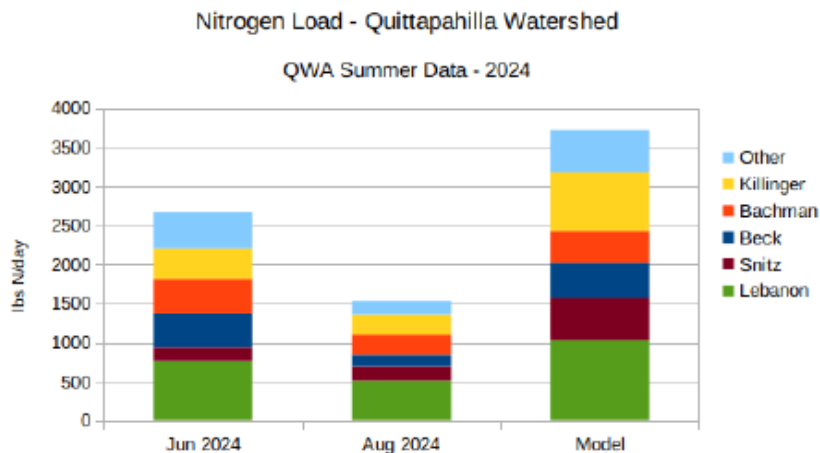
Hi everyone,
Let me start by apologizing for this long message.

QWA's monitoring efforts have allowed us to grow our water quality database. With this body of data available to us, I thought it might be interesting to look at one way (of many) that our monitoring data can be useful to planning. I believe that there are very few volunteer monitoring programs whose data could be used to do this type of analysis. Very few have the capability and/or patience to make discharge measurements. Even fewer follow the quality assurance procedures that allow the generation of reliable water quality data. It is a credit to Mike and Kent for setting up this monitoring effort, Katie for keeping us all organized and on track and our members for being so focused on getting good data. It is truly remarkable, so kudos to you all.

Often planners rely on models to point us in the right direction regarding actions to protect water quality. However, I have seen several situations where models get it wrong because of incorrect assumptions built into them. So it is best to often verify that a model is providing accurate outputs and the best way to do that is by comparing model outputs to real-world monitoring data. So I decided to take data from our most recent two sampling events (June and August) and compare them to outputs from the "Model My Watershed" site that Kara told us about earlier this year. This is an awesome tool for watershed planners and, if you haven't checked it out already, you should. It is at <https://modelmywatershed.org/>.

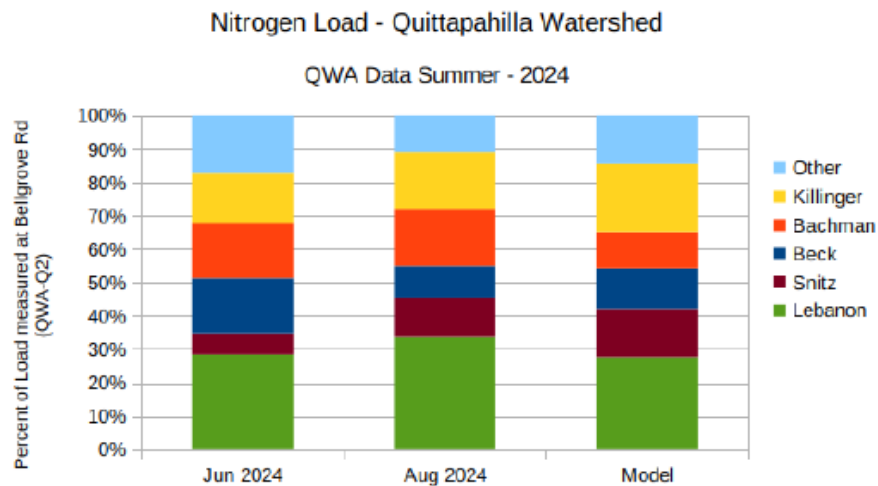
I want to start by emphasizing that this exercise is intended simply to show how our data can be used. This is NOT a scientifically valid analysis and is not ready for posting on our website. We would need more monitoring events over varying conditions to have that level of confidence. However, it shows how the data can be used and I believe it also shows that we are on the right track with our efforts.

My example uses nitrogen loads in the Quittie watershed. Using our Total Nitrogen concentrations and our discharge measurements from our June and August 2024 sampling, I calculated what the instantaneous nitrogen load was at each of our sampling sites. I also added a "Lebanon" source which is the nitrogen load measured at site Q1 minus the load measured at site S1. So I'm basically saying that any nitrogen at site Q1 that did not come from S1 was from "Lebanon". Likewise, I added another source called "Other" that was calculated by totaling all the measured loads from upstream of site Q2 and subtracting them from the measured nitrogen load at Q2. So it is an estimate of the nitrogen load from sources other than those that we measured, for example, any sources to the Quittie from just below the mouth of Killinger Creek down to site Q2.



The first chart (above) shows Q2 site's nitrogen loads as pounds per day for our sampling in June and August along with the model's estimates of these same quantities. The load at Q2 is segmented based on the loads from our other sites. The first thing you may notice is that the model is estimating a greater nitrogen load per day than our data. This is expected because our data is summer only whereas the model estimates on a year-round basis. Nitrogen loads tend to be greater during the winter (non-growing season). Also, note the variation in nitrogen load at Q2 between our June and August sampling. This is why more data is needed over time for a definitive answer.

The second chart (below) shows what percent of the nitrogen load at Site Q2 comes from the other sources. Our data and the model seem to agree that the largest source is the "Lebanon" source which includes the discharge from the wastewater plant on Dairy Road. There is also agreement that the next largest source is from Killinger Creek. There are slight differences regarding the relative importance of Snitz Creek, Beck Creek and Bachman Run. Again – any conclusions will require more data, but you can see how useful our monitoring data will be to properly using model outputs.



So if you made it this far without falling asleep, thanks for hanging in there. I hope you found it interesting.

Kent Crawford

Sep 5, 2024, 10:22 PM

to Bob, Mike, Katie, Kara, Gary, Alyssa

Re: An example of how useful our water quality data can be

Very good example to show one of the uses of our data. I can see using analyses like this to prepare graphics for presentations and public events. And yes, our data-collection program is something to be proud of. Now, if we can just get those high-flow samples

Kent

Bob Connell

Sep 6, 2024, 4:20 PM

to Kent, Mike, Katie, Kara, Gary, Alyssa

Re: An example of how useful our water quality data can be

I couldn't agree more about the high flow sampling. Over the next week, I'll try assembling the autosamplers to determine what (if anything) we need to get to make them functional. Once they are working, we'll schedule a session to go over setting them up and maybe plan a sampling event with them.

Bob

from: Bob Connell

to: Michael Schroeder, Katie Hollen, Kent Crawford, Kara Lubold, Gary Zelinske, Alyssa Bellucci

date: Sep 5, 2024, 1:20 PM

subject: Lab results for August samples

Hi Everyone,

I just wanted you to know that all of the lab results from our August 2024 sampling are in the database accessible through the QWA data portal (<http://147.185.239.141/qwa/index.php>). The only results we have not yet received are for the Field Replicate sample we collected at Q2 on 8/5/24.

The lab results also include our other Field QA samples: The Trip Blank and the Equipment Blank.

I've attached the lab results for those samples to this message. They are not entered into our database.

Trip Blank

Purpose: Ultra-pure (lab grade) water that is placed in a standard sample bottle and transported and handled identical to all of our samples for that day. All levels should be below the limit of detection unless some part of our sample handling causes contamination.

Results –

Parameter	Value	Limit of Detection	Comment
Alkalinity	206.0 mg/L	0.01 mg/L	Need to discuss with PA DEP
Aluminum (dissolved)	18.5 µg/L	15.0 µg/L	Unclear how aluminum could be introduced into this sample. All but one of our dissolved Al samples to date have been below the limit of detection.
Aluminum (total)	19.0 µg/L	15.0 µg/L	
Total Organic Carbon	0.74 mg/L	0.5 mg/L	Unclear how C was introduced to the sample.
Zinc (dissolved)	34.0 µg/L	5.0 µg/L	Once again, unclear how Zn was introduced.
Zinc (total)	39.9 µg/L	5.0 µg/L	

Conclusion: Overall, good results. Out of 57 parameters, only 6 had an issue.

The aluminum and TOC levels were just above the limit of detection, so it is conceivable that this was due to random noise in the lab analysis. Not that concerning.

The Zn levels are more concerning since they are significantly above the limit of detection. My guess is contamination in the sample bottles existed prior to use – even though these were new bottles. We could test this by pre-rinsing the bottle with nitric acid prior to putting the DI water in on a future Trip Blank.

I have no idea what is behind the alkalinity result. As I said above, we should discuss this with PA DEP.

Equipment Blank

Purpose: Ultra-pure (lab grade) water that is processed through the equipment used for collecting and processing our samples. It is used to detect any sources of contamination coming from the equipment (e.g. pipets, filters, tubing) used in preparing the samples. All levels should be below the limit of detection.

Results – All levels were below the limit of detection except for the following parameter:

Parameter	Value	Limit of Detection	Comment
Total Nitrogen as N	0.42 mg/L	0.05 mg/L	Potential contamination from nitric acid.

Conclusion: Overall, excellent results. In fact, these results were even better than the trip blank, which raises additional questions about the trip blank results since they would be expected to be less than the equipment blank results.

The only questionable parameter in the equipment blank was Total Nitrogen. I have been concerned about the possibility of contamination of our nutrient samples by fumes from the nitric acid that we use for preserving the metals samples. While that is a possible cause, I would have expected to see the Nitrate results to also be high on the equipment blank and they were not. So we'll have to keep watching this.

2 Attachments • Scanned by Gmail

1. Equipment Blank (3 pages)



Date of Issue: 09/05/2024 04:05:49
 DEP Bureau of Laboratories - Harrisburg
 P.O. Box 1467
 2575 Interstate Drive
 Harrisburg, PA 17105-1467
 Contact Phone Number: (717) 346-7200

NELAP - accredited by _____
 NJ DEP - Laboratory Number: PA059
 PA DEP LAP - DEP Lab ID: 22-00223

Analytical Report For
 Water Supply Management

Sample ID: 4479 036 Date Collected: 08/08/2024 11:25:00 AM Lab Sample ID: I2024013308 Status: Completed

Name of Sample Collector: Quittapahilla Creek WIP Monitoring

Date Received: 08/09/2024

County: NOT INDICATED

State:

Municipality: NOT INDICATED

Location: NOT INDICATED

Reason: Routine Sampling

Project: NOT INDICATED

Standard Analysis: 087

Matrix: Water

Stream Condition:

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00410 ALKALINITY AS CaCO3 @ pH 4.5	0.2 mg/L	08/09/2024 01:52 PM	JAHOGUE	SM 2320B
** Comment ** Sample bottle had headspace present before analysis				
01106H ALUMINUM, DISSOLVED (WATER & WASTE) BY ICPMS	<15.0 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01105H ALUMINUM, TOTAL (WATER & WASTE) ICPMS	<15.0 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
00608A AMMONIA DISSOLVED AS NITROGEN	<.02 mg/L (U)	08/19/2024 07:09 PM	MAMCNULTY	EPA 350.1
00610A AMMONIA TOTAL AS NITROGEN	<.02 mg/L (U)	08/19/2024 07:07 PM	MAMCNULTY	EPA 350.1
01097H ANTIMONY, TOTAL (WATER & WASTE) BY ICPMS	<2.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8

**Analytical Report For
Water Supply Management**

Sample ID: 4479 036

Date Collected: 08/08/2024 11:25:00 AM

Lab Sample ID: I2024013308

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
01002H ARSENIC, TOTAL (WATER & WASTE) BY ICPMS	<3.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01007A BARIUM, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01022K BORON, TOTAL (WATER & WASTE) BY ICP	<200. ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01025H CADMIUM, DISSOLVED (WATER & WASTE) BY ICPMS	<0.200 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01027H CADMIUM, TOTAL (WATER & WASTE) BY ICPMS	<0.200 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
00916A CALCIUM, TOTAL (WATER & WASTE) BY ICP	<0.100 mg/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01034H CHROMIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01037H COBALT, TOTAL (WATER & WASTE) BY ICP	<1.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01040H COPPER, DISSOLVED (WATER & WASTE) BY ICPMS	<0.7498 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
** Comment ** Temporarily not accredited. Result not for compliance.				
01042H COPPER, TOTAL (WATER & WASTE) BY ICPMS	<0.7498 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
** Comment ** Temporarily not accredited. Result not for compliance.				
00631A Dissolve Nitrate & Nitrite Nitrogen	<0.05 mg/L (U)	08/09/2024 11:34 AM	TBEAR	EPA 353.2
00671A Dissolve Ortho Phosphorus	<.01 mg/L (U)	08/09/2024 03:49 PM	LBENT	EPA 365.1
00602A Dissolved Nitrogen as N	<0.1150 mg/L (U)	08/12/2024 04:45 PM	TBEAR	SM 4500-NC
00666A Dissolved Phosphorus as P	<0.01 mg/L (U)	08/26/2024 03:56 PM	LBENT	EPA 365.1
00900 HARDNESS, TOTAL (CALCULATED)	0 mg/L	08/12/2024 11:06 AM	CREITMEYER	SM 2340 B
** Comment ** Accredited by NJ only - accreditation not available from PA				
01046A IRON, DISSOLVED (WATER & WASTE) BY ICP	<100. ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01045A IRON, TOTAL (WATER & WASTE) BY ICP	<100.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01049H LEAD, DISSOLVED (WATER & WASTE) BY ICPMS	<1.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01051H LEAD, TOTAL (WATER & WASTE) BY ICPMS	<1.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01130A LITHIUM, DISSOLVED (WATER & WASTE) BY ICP	<25.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01132A LITHIUM, TOTAL (WATER & WASTE) BY ICP	<25.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
99020 Low Bromide by IC	<25.00 ug/L	08/28/2024 02:25 PM	JOMARKEY	EPA 300.1 B
00927A MAGNESIUM, TOTAL (WATER & WASTE) BY ICP	<0.010 mg/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01056A MANGANESE, DISSOLVED (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01055A MANGANESE, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
71900I MERCURY, TOTAL	<0.200 ug/L (U)	08/13/2024 12:19 PM	FHUNZIKER	EPA 245.1
01065H NICKEL, DISSOLVED (WATER & WASTE) BY ICPMS	<8.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01067H NICKEL, TOTAL (WATER & WASTE) BY ICPMS	<8.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
82550 OSMOTIC PRESSURE, MOSM/KG	<1 mosm/kg (U)	08/09/2024 10:26 AM	CLONTZ	PADEP 391-2000-008
00403 pH, Lab (Electrometric)	6.2 pH units	08/09/2024 01:52 PM	JAHOUE	SM 4500-H+ B

**Analytical Report For
Water Supply Management**

Sample ID: 4479 036

Date Collected: 08/08/2024 11:25:00 AM

Lab Sample ID: I2024013308

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
** Comment ** Holding time exceeded				
00935A POTASSIUM, DISSOLVED (WATER & WASTE) BY ICP	<1.00 mg/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
00937A POTASSIUM, TOTAL (WATER & WASTE) BY ICP	<1.00 mg/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
01145H SELENIUM, DISSOLVED (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01147H SELENIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01077H SILVER, TOTAL (WATER & WASTE) BY ICPMS	<0.400 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
00929A SODIUM, TOTAL (WATER & WASTE) BY ICP	<0.200 mg/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
00095 SPECIFIC CONDUCTIVITY @ 25.0 C	1.61 umhos/cm	08/19/2024 01:46 PM	JAHOE	SM 2510B
01082A STRONTIUM, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/12/2024 11:06 AM	CREITMEYER	EPA 200.7
00403T Temperature at which pH is measured	21.31 C	08/09/2024 01:52 PM	JAHOE	SM 4500-H+ B
01059H THALLIUM, TOTAL (WATER & WASTE) BY ICPMS	<2.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
00940A Total Chloride-Colorimetric	<4.0 mg/L (U)	08/16/2024 04:55 PM	MTUZINSKI	SM 4500-CL- E
70300U TOTAL DISSOLVED SOLIDS @ 180C BY USGS-I-1750	<20 mg/L (U)	08/09/2024 11:01 AM	CLONTZ	USGS I-1750-85
00620 Total Nitrate Nitrogen-Ion Chromatograph	<0.04 mg/L (U)	08/09/2024 02:16 PM	TVOROBAYCH	EPA 300.0
00615 Total Nitrite Nitrogen-Ion Chromatograph	<0.04 mg/L (U)	08/09/2024 02:16 PM	TVOROBAYCH	EPA 300.0
00600A Total Nitrogen as N	0.42 mg/L	08/12/2024 04:43 PM	TBEAR	SM 4500-NC
00680 Total Organic Carbon	<0.50 mg/L (U)	08/20/2024 09:20 AM	JOMARKEY	SM 5310 C
70507A Total Ortho Phosphorus as P	<0.01 mg/L (U)	08/09/2024 03:23 PM	LBENT	EPA 365.1
00665A Total Phosphorus as P	<.01 mg/L (U)	08/26/2024 03:54 PM	LBENT	EPA 365.1
00945 Total Sulfate-Ion Chromatograph	<1.00 mg/L (U)	08/09/2024 02:16 PM	TVOROBAYCH	EPA 300.0
00530 TOTAL SUSPENDED SOLIDS	<20 mg/L (U)	08/09/2024 02:33 PM	JULLEHMAN	USGS I-3765-85
01087H VANADIUM, TOTAL (WATER & WASTE) BY ICPMS	<13.0 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01090H ZINC, DISSOLVED (WATER & WASTE) BY ICPMS	<5.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8
01092H ZINC, TOTAL (WATER & WASTE) BY ICPMS	<5.00 ug/L (U)	08/12/2024 09:05 AM	SCHOY	EPA 200.8

The results of the analyses provided in this laboratory report relate only to the sample(s) identified therein. Unless otherwise noted, the results presented on this laboratory report meet all requirements of the 2016 TNI standard. Sample was in acceptable condition when received by the Laboratory. Any exceptions are noted in the report.
* denotes tests that the laboratory is not accredited for

U - Indicates analysis was performed for the test but it was not detected. The sample quantitation limit is reported.

J - Indicates an estimated value, reported between Reporting Limit (RL) and Minimum Detection Limit (MDL).

Jennifer Fesler, Technical Director, Bureau of Laboratories

2. Trip Blank (3 pages)



Date of Issue: 08/29/2024 04:06:12
 DEP Bureau of Laboratories - Harrisburg
 P.O. Box 1467
 2575 Interstate Drive
 Harrisburg, PA 17105-1467
 Contact Phone Number: (717) 346-7200

NELAP - accredited by _____
 NJ DEP - Laboratory Number: PA059
 PA DEP LAP - DEP Lab ID: 22-00223

Analytical Report For
 Water Supply Management

Sample ID: 4479 033 Date Collected: 08/08/2024 08:55:00 AM Lab Sample ID: I2024013305 Status: Completed

Name of Sample Collector: Quittapahilla Creek WIP Monitoring
 Date Received: 08/09/2024

County: NOT INDICATED State:
 Municipality: NOT INDICATED

Location: NOT INDICATED
 Reason: Routine Sampling
 Project: NOT INDICATED
 Standard Analysis: 087
 Matrix: Water

Stream Condition:

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00410 ALKALINITY AS CaCO3 @ pH 4.5	206.0 mg/L	08/09/2024 01:25 PM	JAHOQUE	SM 2320B
** Comment ** Sample bottle had headspace present before analysis				
01106H ALUMINUM, DISSOLVED (WATER & WASTE) BY ICPMS	18.500 ug/L	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01105H ALUMINUM, TOTAL (WATER & WASTE) ICPMS	19.000 ug/L	08/13/2024 11:35 AM	SCHOY	EPA 200.8
00608A AMMONIA DISSOLVED AS NITROGEN	<.02 mg/L (U)	08/19/2024 06:43 PM	MAMCNULTY	EPA 350.1
00610A AMMONIA TOTAL AS NITROGEN	<.02 mg/L (U)	08/19/2024 06:41 PM	MAMCNULTY	EPA 350.1
01097H ANTIMONY, TOTAL (WATER & WASTE) BY ICPMS	<2.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8

**Analytical Report For
Water Supply Management**

Sample ID: 4479 033

Date Collected: 08/08/2024 08:55:00 AM

Lab Sample ID: I2024013305

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
01002H ARSENIC, TOTAL (WATER & WASTE) BY ICPMS	<3.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01007A BARIUM, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01022K BORON, TOTAL (WATER & WASTE) BY ICP	<200. ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01025H CADMIUM, DISSOLVED (WATER & WASTE) BY ICPMS	<0.200 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01027H CADMIUM, TOTAL (WATER & WASTE) BY ICPMS	<0.200 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
00916A CALCIUM, TOTAL (WATER & WASTE) BY ICP	<0.100 mg/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01034H CHROMIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01037H COBALT, TOTAL (WATER & WASTE) BY ICP	<1.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01040H COPPER, DISSOLVED (WATER & WASTE) BY ICPMS	<0.7498 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
** Comment ** Temporarily not accredited. Result not for compliance.				
01042H COPPER, TOTAL (WATER & WASTE) BY ICPMS	<0.7498 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
** Comment ** Temporarily not accredited. Result not for compliance.				
00631A Dissolve Nitrate & Nitrite Nitrogen	<0.05 mg/L (U)	08/09/2024 09:24 AM	TBEAR	EPA 353.2
00671A Dissolve Ortho Phosphorus	<0.01 mg/L (U)	08/09/2024 03:07 PM	LBENT	EPA 365.1
00602A Dissolved Nitrogen as N	<0.1150 mg/L (U)	08/12/2024 04:17 PM	TBEAR	SM 4500-NC
00666A Dissolved Phosphorus as P	<0.01 mg/L (U)	08/13/2024 12:47 AM	LBENT	EPA 365.1
** Comment ** Sample not properly preserved - pH > 2.0				
00900 HARDNESS, TOTAL (CALCULATED)	0 mg/L	08/14/2024 11:16 AM	CREITMEYER	SM 2340 B
** Comment ** Accredited by NJ only - accreditation not available from PA				
01046A IRON, DISSOLVED (WATER & WASTE) BY ICP	<100. ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01045A IRON, TOTAL (WATER & WASTE) BY ICP	<100.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01049H LEAD, DISSOLVED (WATER & WASTE) BY ICPMS	<1.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01051H LEAD, TOTAL (WATER & WASTE) BY ICPMS	<1.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01130A LITHIUM, DISSOLVED (WATER & WASTE) BY ICP	<25.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01132A LITHIUM, TOTAL (WATER & WASTE) BY ICP	<25.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
99020 Low Bromide by IC	<25.00 ug/L	08/28/2024 02:25 PM	JOMARKEY	EPA 300.1 B
00927A MAGNESIUM, TOTAL (WATER & WASTE) BY ICP	<0.010 mg/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01056A MANGANESE, DISSOLVED (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
01055A MANGANESE, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7
71900I MERCURY, TOTAL	<0.200 ug/L (U)	08/13/2024 12:12 PM	FHUNZIKER	EPA 245.1
01065H NICKEL, DISSOLVED (WATER & WASTE) BY ICPMS	<8.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
01067H NICKEL, TOTAL (WATER & WASTE) BY ICPMS	<8.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8
82550 OSMOTIC PRESSURE, MOSM/KG	<1 mosm/kg (U)	08/09/2024 10:20 AM	CLONTZ	PADEP 391-2000-008

Analytical Report For Water Supply Management					
Sample ID: 4479 033		Date Collected: 08/08/2024 08:55:00 AM		Lab Sample ID: I2024013305	
Status: Completed					
Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method	
00403 pH, Lab (Electrometric)	8.2 pH units	08/09/2024 01:25 PM	JAHOE	SM 4500-H+ B	
** Comment ** Holding time exceeded					
00935A POTASSIUM, DISSOLVED (WATER & WASTE) BY ICP	<1.00 mg/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7	
00937A POTASSIUM, TOTAL (WATER & WASTE) BY ICP	<1.00 mg/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7	
01145H SELENIUM, DISSOLVED (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
01147H SELENIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
01077H SILVER, TOTAL (WATER & WASTE) BY ICPMS	<0.400 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
00929A SODIUM, TOTAL (WATER & WASTE) BY ICP	<0.200 mg/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7	
00095 SPECIFIC CONDUCTIVITY @ 25.0 C	1.19 umhos/cm	08/19/2024 01:37 PM	JAHOE	SM 2510B	
01082A STRONTIUM, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	08/14/2024 11:16 AM	CREITMEYER	EPA 200.7	
00403T Temperature at which pH is measured	21.36 C	08/09/2024 01:25 PM	JAHOE	SM 4500-H+ B	
01059H THALLIUM, TOTAL (WATER & WASTE) BY ICPMS	<2.00 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
00940A Total Chloride-Colorimetric	<4.0 mg/L (U)	08/16/2024 08:35 PM	MTUZINSKI	SM 4500-CL- E	
70300U TOTAL DISSOLVED SOLIDS @ 180C BY USGS-I-1750	<20 mg/L (U)	08/09/2024 11:01 AM	CLONTZ	USGS I-1750-85	
00620 Total Nitrate Nitrogen-Ion Chromatograph	<0.04 mg/L (U)	08/09/2024 01:37 PM	TVOROBAYCH	EPA 300.0	
00615 Total Nitrite Nitrogen-Ion Chromatograph	<0.04 mg/L (U)	08/09/2024 01:37 PM	TVOROBAYCH	EPA 300.0	
00600A Total Nitrogen as N	<0.25 mg/L (U)	08/12/2024 04:15 PM	TBEAR	SM 4500-NC	
00680 Total Organic Carbon	0.74 mg/L	08/20/2024 09:20 AM	JOMARKEY	SM 5310 C	
Sample not properly preserved - pH > 2.0; pH adjusted with 15 drops of 10% H2SO4					
70507A Total Ortho Phosphorus as P	<0.01 mg/L (U)	08/09/2024 03:04 PM	LBENT	EPA 365.1	
00665A Total Phosphorus as P	<0.01 mg/L (U)	08/13/2024 12:45 AM	LBENT	EPA 365.1	
** Comment ** Sample not properly preserved - pH > 2.0					
00945 Total Sulfate-Ion Chromatograph	<1.00 mg/L (U)	08/09/2024 01:37 PM	TVOROBAYCH	EPA 300.0	
00530 TOTAL SUSPENDED SOLIDS	<20 mg/L (U)	08/09/2024 02:33 PM	JULLEHMAN	USGS I-3765-85	
01087H VANADIUM, TOTAL (WATER & WASTE) BY ICPMS	<13.0 ug/L (U)	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
01090H ZINC, DISSOLVED (WATER & WASTE) BY ICPMS	34.000 ug/L	08/13/2024 11:35 AM	SCHOY	EPA 200.8	
01092H ZINC, TOTAL (WATER & WASTE) BY ICPMS	39.900 ug/L	08/13/2024 11:35 AM	SCHOY	EPA 200.8	

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Jennifer Fesler, Technical Director, Bureau of Laboratories

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Kent Crawford
Sep 8, 2024, 11:20 PM
to Bob, Mike, Katie, Kara, Gary, Alyssa
Re: Lab results for August samples

Very happy to see these results for the quality control samples. I have studied the results and have no answer for why some of the parameters are above detection limits. But here are some thoughts (not explanations).

Relative to the total nitrogen measurement, most of the nitrogen in our field samples would be in the form of nitrate. But, nitrate in the QC samples was below the detection limit. So, that

leads me to believe the nitrogen contamination is from ammonia nitrogen. Ammonia was not measured in the QC samples. Is there any chance of ammonia contamination?

Alkalinity is high (around 200 mg/L) in the native waters of the Quittapahilla Watershed. Alkalinity in the blank sample was 206 mg/L. Just an observation.

I think we can request that the lab do a rerun. The lab saves the samples for a certain length of time. Should we?

The purpose for submitting quality control samples is for a check on our techniques. When we find unwanted results, that should trigger a review of our operations. I think our techniques are just fine, but let's think about it. In my view, one possibility for contamination would be in our storage of the sample bottles. Can we do better on this front? What about our storage of the ultra pure water? How old was our ultra pure? Where has it been stored? For our field techniques, isn't there a tube that we reuse without cleaning it??? I can't remember exactly what our procedure is. Really, I think our procedures are very very good. But, these results call for a mental evaluation to see where contamination could be introduced.

Overall, VERY GOOD!

Thank you field crew!!

Dr. J. Kent Crawford
Environmental Scientist
Hummelstown, PA

Kara Lubold
Sep 9, 2024, 10:37 AM
to Kent, Bob, Mike, Katie, Gary, Alyssa
Re: Lab results for August samples

Good morning Kent and All,

I drove down to DEP Aug. 6 and picked up cubitainers of DI and Ultrapure water to replenish our stock. Mark Hoger was not available, but someone else from DEP, who lived close by, came in to help me. He said that the DI dispenser showed a measuring of 6 and 14 microsiemens (μS), and that it usually reads below 1 μS . Ultrapure dispenser reading was at normal levels.

He wasn't sure why it was reading at that level, but suspected the filters needed to be changed. I was told the DI water should be ok for our usage but said to keep it in mind in case our results came back a little off.

Hope this helps!

Kara

Katie Hollen

Sep 9, 2024, 12:04 PM

to Bob, Kara, Kent, Mike, Gary, Alyssa

Re: Lab results for August samples

Hi all,

Let's discuss at the next QWA meeting. In the meantime, a couple points to ponder...

Technically, the trip blank was not a true lab -> field -> lab trip blank. We got the ultrapure water from the DEP lab as Kara said, stored it a couple different places (Kara's car to my office to LVC), then used it to fill our bottles at LVC and carried it in the field with us. If I recall correctly, we rinsed the trip blank bottles with the ultrapure prior to filling- were we supposed to do that? Or, did we rinse with DI water instead of ultrapure? Also, we did not use the new DI water. Maybe our existing supply was compromised somehow (but then again, that doesn't account for differences between the trip and field blanks).

Kent- If I'm interpreting the results correctly, ammonia nitrogen was below the detection limits, as were nitrate and nitrite nitrogen. So where would any other nitrogen in the "Total Nitrogen" come from?

A lot to think about but very encouraging! Thanks to the fantastic volunteers and to Bob for reviewing the data!

Katie

Katie Hollen

Watershed Specialist

Lebanon County Conservation District

Bob Connell

Sep 9, 2024, 10:00 PM

to Katie, Kara, Kent, Mike, Gary, Alyssa

Re: Lab results for August samples

For our discussion at the meeting, consider the EPA method for metals sampling (https://www.epa.gov/sites/default/files/2015-10/documents/method_1669_1996.pdf). Section 2.1 talks about prep of sampling bottles. We are using new bottles, assuming they are clean, but EPA is not making that assumption. This could explain the metals blanks that were high. May also apply to the N sample.

Food for thought.

Bob

Kent Crawford

Sep 9, 2024, 10:33 PM

to Katie, Bob, Kara, Mike, Gary, Alyssa. Katie, Kara

Re: Lab results for August samples

You are right. The ammonia concentration in both QC samples was below the detection limit. I did not see that because I looked for it under "Nitrogen, ammonia" rather than under "Ammonia Nitrogen."

So, the possible species of nitrogen that comprise "total nitrogen" are:

Nitrate nitrogen -- typically the major component of total nitrogen. We know that in the Quittie watershed, concentrations in our samples have been anywhere from 5 to 10 mg/L (and maybe a little higher).

Nitrite nitrogen -- typically very low because in oxygenated waters, the nitrite quickly oxidizes to nitrate.

Organic nitrogen -- Typically low in environmental samples, but could be high for a stream that is heavily influenced by effluents from a wastewater treatment plant or perhaps runoff from animal operations (pigs, chickens, cattle, for example).

Ammonia nitrogen -- Also rapidly oxidizes to nitrate in aerobic environments.

There is another nitrogen measure that is frequently reported and that is Kjeldahl nitrogen. But, this is really just ammonia nitrogen plus organic nitrogen.

It is not very concerning to me that the DI water from DEP had a specific conductance (SC) of 6 or even 14 microSiemens. Remember that our field samples have SC readings of 500 microSiemens or larger. Even 14 microSiemens is still a very dilute water. Of course, SC could be contributed by any ionic substance, for example, nitrate (NO₃). Hard to know, but I would guess the specific conductance reading reflects atmospheric contamination from carbon dioxide. Carbon dioxide plus water yields carbonic acid H₂CO₃ which dissociates into carbon dioxide HCO₃⁻ and water (H⁺). So, I am not too worried about that. And yes, the SC readings suggest that it is time to replace the filters in the DI water system at DEP.

So, all this, and no explanation for the high readings in our QC samples.

Kent

from: Bob Connell
to: Michael Schroeder, Katie Hollen, Kent Crawford, Kara Lubold, Gary Zelinske, Alyssa Bellucci
date: Sep 12, 2024, 8:22 PM
subject: Results from the field replicate samples collected at site Q2 on 8/5/24

Hi everyone,

Below are the results from the field replicate samples that were collected on 8/5/24 at site Q2. The results are excellent! One way to evaluate replicate samples is to look at the range (difference between the two measures for the same parameter) divided by the average of the two measures. This statistic is called the Range Percent. Results become questionable when this statistic exceeds 10%. The table below has the results sorted by Range Percent in descending order.

Of the 58 parameters compared, only 5 (8% of the parameters) exceeded 10%. Of these, two (both Ammonia parameters) were near their detection limit. The range percent becomes a less

meaningful measure when values are near the detection limit. So really it was just total iron, total aluminum and low bromide that were questionable.

51 of the 58 parameters (88%) had a range percent of less than 5%! These are very good results considering they were collected by different individuals.

So way to go everyone!

Results of Field Replicates at Site Q2 on 8/5/24

Parameter	Rep 1	Rep 2	Units	Range %	Comment
Ammonia (NH3 + NH4+), water, unfiltered, milligrams per liter as nitrogen	0.04	0.03	mg/l as N	28.57%	Close to the limit of detection.
Iron, water, unfiltered, recoverable, micrograms per liter	245	193	ug/l	23.74%	
Ammonia (NH3 + NH4+), water, filtered, milligrams per liter as nitrogen	0.03	0.024	mg/l as N	22.22%	Close to the limit of detection.
Aluminum, water, unfiltered, recoverable, micrograms per liter	102	87.1	ug/l	15.76%	
Low Bromide by IC	25	28.87	ug/L	14.37%	
Copper, water, unfiltered, recoverable, micrograms per liter	3.52	3.23	ug/l	8.59%	Close to the limit of detection.
Manganese, water, unfiltered, recoverable, micrograms per liter	29	27	ug/l	7.14%	
Acid neutralizing capacity, water, unfiltered	203.8	211.4	mg/l CaCO3	3.66%	
Dissolved solids dried at 180 degrees Celsius, water, filtered, milligrams per liter	372	360	mg/l	3.28%	
Hardness, water, milligrams per liter as calcium carbonate	252	259	mg/l CaCO3	2.74%	
Zinc, water, unfiltered, recoverable, micrograms per liter	9.34	9.09	ug/l	2.71%	
Calcium, water, unfiltered, recoverable, milligrams per liter	73.6	75.6	mg/l	2.68%	

Barium, water, unfiltered, recoverable, micrograms per liter	39	40	ug/l	2.53%	
Copper, water, filtered, micrograms per liter	1.67	1.63	ug/l	2.42%	
Strontium, water, unfiltered, recoverable, micrograms per liter	220	225	ug/l	2.25%	
Potassium, water, unfiltered, recoverable, milligrams per liter	4.95	5.05	mg/l	2.00%	
Magnesium, water, unfiltered, recoverable, milligrams per liter	16.6	16.9	mg/l	1.79%	
Phosphorus, water, unfiltered, milligrams per liter as phosphorus	0.139	0.141	mg/l as P	1.43%	
Organic carbon, water, unfiltered, milligrams per liter	1.5	1.48	mg/l	1.34%	
Sodium, water, unfiltered, recoverable, milligrams per liter	23.3	23.6	mg/l	1.28%	
Total nitrogen [nitrate + nitrite + ammonia + organic-N], water, unfiltered, milligrams per liter	6.42	6.36	mg/l	0.94%	
Orthophosphate, water, filtered, milligrams per liter as phosphorus	0.108	0.107	mg/l as P	0.93%	
Phosphorus, water, filtered, milligrams per liter as phosphorus	0.124	0.123	mg/l as P	0.81%	
Nitrate plus nitrite, water, filtered, milligrams per liter as nitrogen	5.9	5.87	mg/l as N	0.51%	
Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius	636	633	uS/cm @25C	0.47%	
Chloride, water, filtered, milligrams per liter	45	45.2	mg/l	0.44%	
Potassium, water, filtered, milligrams per liter	4.85	4.87	mg/l	0.41%	
Total nitrogen [nitrate + nitrite + ammonia + organic-N], water, filtered, milligrams per liter	6.46	6.475	mg/l	0.23%	
Nitrate, water, unfiltered, milligrams per liter as nitrogen	6.01	6.02	mg/l as N	0.17%	

Sulfate, water, filtered, milligrams per liter	42.17	42.18	mg/l	0.02%	
Aluminum, water, filtered, micrograms per liter	15	15	ug/l	0.00%	
Antimony, water, unfiltered, micrograms per liter	2	2	ug/l	0.00%	
Arsenic, water, unfiltered, micrograms per liter	3	3	ug/l	0.00%	
Boron, water, unfiltered, recoverable, micrograms per liter	200	200	ug/l	0.00%	
Cadmium, water, filtered, micrograms per liter	0.2	0.2	ug/l	0.00%	
Cadmium, water, unfiltered, micrograms per liter	0.2	0.2	ug/l	0.00%	
Chromium, water, unfiltered, recoverable, micrograms per liter	4	4	ug/l	0.00%	
Cobalt, water, unfiltered, recoverable, micrograms per liter	1	1	ug/l	0.00%	
Iron, water, filtered, micrograms per liter	100	100	ug/l	0.00%	
Lead, water, filtered, micrograms per liter	1	1	ug/l	0.00%	
Lead, water, unfiltered, recoverable, micrograms per liter	1	1	ug/l	0.00%	
Lithium, water, filtered, micrograms per liter	25	25	ug/l	0.00%	
Lithium, water, unfiltered, recoverable, micrograms per liter	25	25	ug/l	0.00%	
Manganese, water, filtered, micrograms per liter	17	17	ug/l	0.00%	
Mercury, water, unfiltered, recoverable, micrograms per liter	0.2	0.2	ug/l	0.00%	
Nickel, water, filtered, micrograms per liter	8	8	ug/l	0.00%	
Nickel, water, unfiltered, recoverable, micrograms per liter	8	8	ug/l	0.00%	
Osmotic pressure, water, unfiltered, milliosmoles per kilogram	9	9	mosm/kg	0.00%	

pH, water, unfiltered, laboratory, standard units	7.9	7.9	std units	0.00%	
Selenium, water, filtered, micrograms per liter	4	4	ug/l	0.00%	
Selenium, water, unfiltered, micrograms per liter	4	4	ug/l	0.00%	
Silver, water, unfiltered, recoverable, micrograms per liter	0.4	0.4	ug/l	0.00%	
Thallium, water, unfiltered, micrograms per liter	2	2	ug/l	0.00%	
Thallium, water, unfiltered, micrograms per liter	2	2	ug/l	0.00%	
Nitrite, water, unfiltered, milligrams per liter as nitrogen	0.05	0.05	mg/l as N	0.00%	
Orthophosphate, water, unfiltered, milligrams per liter as phosphorus	0.11	0.11	mg/l as P	0.00%	
Suspended solids, water, unfiltered, milligrams per liter	20	20	mg/l	0.00%	
Vanadium, water, unfiltered, micrograms per liter	13	13	ug/l	0.00%	

Katie Hollen

Sep 13, 2024, 1:57 PM

to Bob, Mike, Kent, Kara, Gary, Alyssa

Re: Results from the field replicate samples collected at site Q2 on 8/5/24

As always, thank you for crunching the numbers, Bob! Way to go, team! This is fantastic!

Katie

Appendix 2. Watershed Action Team Meeting Minutes, Sept. 5, 2024



Lebanon CAP Watershed Action Team

September 5, 2024 - Minutes

Members Present: Bethany Canner, Russ Collins, Hannah Hartman, Katie Hollen, Kara Lubold, Rocky Powell & Mike Schroeder

1. Introductions

- Hannah Hartman was introduced as the new LCCD manager.

2. In-Process Projects

- Hammer Creek Estates: \$250,000 of CAP funding for construction-related expenses.
- Gerald Horst bridge replacement: \$23,600 of ACAP funding for design and permitting.
- Syner Rd. Phase II: \$213,950.00 of CAP funding. Personnel changes at ARRC have caused some design issues.

3. Completed Projects

- Hernley- CAP: \$8,852.95 (ag project)
- Maulfair- CAP: \$189,308.04 (ag project)

4. Partner Updates

- Clear Creeks Consulting, Rocky Powell
 - o Snitz 2 & 3: No new updates.
 - o Killinger: Site walk scheduled for Sept. 19 with contractor. Will apply for CAP, PFBC, and The Conservation Fund funds in 2025. Because it will be a design-build project, it rules out funding sources that require competitive bids (ACAP, 319, GG).
 - o Beck 6: Chad Krick (DEP) said they should receive a letter with final EPA confirmation of a 319 award by the end of this month or early October.
 - o Snitz 4: Planning to initiate the preliminary design next week.
 - o Bachman: The final stream design and the bridge design are in progress.
- Quittapahilla Watershed Association, Mike Schroeder
 - o Stream restoration projects strategizing meeting scheduled for Sept. 6.
 - o Three monitoring days in August to collect water-quality data and compare new and old streamflow equipment.
 - o Student internship complete. Rocky is reviewing the data.
 - o QWA will supervise an LVC student intern to focus on data management and building their water quality portal.
 - o Working with TLVC to prepare an SRBC grant application for stream signage.
 - o Hosted an SQ1 walkthrough with a Cornwall Manor group and a member from the Consortium. May do similar tours in the coming weeks for other interested parties.



Lebanon CAP Watershed Action Team

- Rocky noted that it would be good to get the existing macroinvertebrate data and reports from LVC to add to the water quality portal.
 - Swatara Watershed Association, Bethany Canner
 - Water trail sign project is continuing. Looking into applying for another SRBC grant, this time for on-water signage to show access points.
 - Doing a couple of tree plantings this fall in Dauphin County.
 - Trout Unlimited, Russ Collins
 - Received a \$780,000+ NFWF grant and a \$740,000+ SRBC grant to cover 3 projects in the Hammer, including work on Hammer Creek Estates.
 - Modifying NFWF award to include construction on Heisey Farm.
- 5. Next Meeting**
- Thursday, October 3, 2024, at 9:00 a.m.

Appendix 3. Meeting Agenda for Countywide Strategizing Meeting

Developing A Strategy for Quittapahilla Watershed Partners Stream Restoration Work Moving Forward

Updated August 19, 2024

Meeting Time & Date: 9:00-11:00 a.m., Friday, Sept. 6, LCCD Conference Room, 2120 Cornwall Rd, Lebanon, PA 17042

Invited Participants

- Mike Schroeder, QWA
- Bob Connell, QWA
- Russ Collins, DFTU & QWA
- Kent Crawford, DFTU & QWA
- Katie Doster, LCCD
- Katie Hollen, LCCD
- Kara Lubold, LCCD & QWA
- Abigail Harvey, TLVC
- Ron Birch, TLVC
- Mike Sherman, TLVC
- Ned Gible, TLVC
- Rocky Powell, Clear Creeks Consulting
- Rich Starr, Ecosystem Planning & Restoration
- Bryan Seipp, Ecosystem Planning & Restoration

Draft Agenda

1. Watershed Plans
 - a. Quittapahilla Creek Restoration and Management Plan (2006)
 - 1) Identified, Prioritized and Scheduled Projects by Subwatershed
 - b. Quittapahilla Creek Watershed Implementation Plan (2021)
 - 1) Identified, Prioritized and Scheduled Projects by Subwatershed
 - 2) Current Schedule and Funding
 - c. Hammer Creek Headwaters Alternate Restoration Plan (2021)
 - 1) Identified, Prioritized and Scheduled Projects?
 - 2) Current Schedule and Funding
2. Projects Status
 - a. Quittapahilla Watershed
 - b. Hammer Creek Watershed

- c. Spring Creek Watershed
3. Future Scheduling and Funding of Projects
 - a. Scheduling Priorities
 - b. Funding Sources

A Brief History of Quittapahilla Creek Watershed Restoration Efforts

Rocky Powell

September 5, 2024

I. Background Information

The seventy-seven square mile Quittapahilla Creek Watershed is situated in the Ridge and Valley physiographic region in Lebanon County, Pennsylvania. Quittapahilla Creek is a tributary to Swatara Creek and is part of the Susquehanna River Basin. Its headwaters begin just southeast of Lebanon, Pennsylvania and it enters the Swatara Creek near North Annville, Pennsylvania.

The major land use in the watershed is agricultural. There are significant areas of urbanization along the Route 422 corridor in the City of Lebanon, West Lebanon, Cleona, and Annville. In addition, new development in the watershed is replacing farms with suburban communities. Past and current land use and land management practices in the rural areas, suburban communities, and urban centers have resulted in degraded water quality, stream bank and bed erosion, sedimentation, flooding, and the loss of riparian and in-stream habitat throughout the Quittapahilla Creek Watershed.

The Pennsylvania Department of Environmental Protection (PADEP) conducted studies in the 1980's and 1990's that indicate impairment of aquatic resources in the Quittapahilla Creek Watershed. In fact, the mainstem as well as all of the major tributaries to the Quittapahilla Creek were listed as impaired in the 303(d) listings. The 2000 305(b) Report prepared by DEP indicated that there are 88.9 miles of stream in the Quittapahilla Creek Watershed. Only 1.82 miles of stream (2%) were found to support designated aquatic life uses. The identified land use activities contributing to impairment include agriculture, crop related agriculture, urban/storm sewers, and bank modification. Sources of impairment include nutrients, siltation, suspended solids, organic enrichment/low dissolved oxygen concentrations, flow alteration, and other habitat alterations.

The Total Maximum Daily Loads (TMDLs) Report (PADEP, 2000) cites excessive sediment and nutrient levels as a major water quality problem in the Quittapahilla Creek Watershed. The report indicates that these pollutants are causing increased algae growth, large accumulations of fine sediments on the streambed, and degradation of in-stream habitat. Although the report attributes the excessive sediment and nutrient levels principally to agricultural activities, these

pollutants are also associated with other upland sources (e.g., urban runoff) as well as in-stream sources (e.g., stream bed and bank erosion).

Since 1997, the Quittapahilla Watershed Association (QWA) and their partners, the Swatara Watershed Association (SWA), Lebanon Valley Conservancy (TLVC), Doc Fritchey Chapter Trout Unlimited (DFTU), Lebanon Valley College and the Lebanon County Conservation District (LCCD) have been working with private landowners and a number of private organizations and public agencies to improve the water quality and aquatic habitat of Quittapahilla Creek.

However, until 2001 there had been no comprehensive assessment, nor coordinated effort to identify and prioritize water quality, habitat and stream channel stability problems throughout the watershed. As a consequence, targeting of stream reaches for improvements had been on a project-by-project basis.

The QWA believed that their best chance for resolving the existing problems and avoiding future problems was to step back from the project-based approach and develop a comprehensive plan of action based on an assessment of the entire watershed. They believed that this approach would serve to focus funding and restoration and management efforts where they are most needed. They also believed that it is the approach that has the greatest chance for long-term success.

Accordingly, in 2001 the QWA sponsored by the Swatara Watershed Association (SWA) contracted Clear Creeks Consulting to conduct an assessment of Quittapahilla Creek Watershed and develop a restoration and management plan focused on addressing the problems identified by the assessment. In cooperation with the QWA, Clear Creeks formed an interdisciplinary team that included Skelly & Loy, Inc.; U.S. Fish & Wildlife Service, Chesapeake Bay Field Office; Penn State Institutes of the Environment, Pennsylvania State University; Lebanon Valley College Department of Biology; and U.S. Geological Survey, New Cumberland Field Office. Supported by Growing Greener Grants received from PADEP in 2001 and 2003, the Assessment Phase of Quittapahilla Watershed Project was completed between 2001 and 2005 and the Planning Phase between 2005 and 2006.

The objectives of this project were:

1. Establish benchmarks for evaluating and documenting changes in the watershed by assessing current hydrologic, water quality, in-stream habitat, and channel stability conditions.
2. Identify and prioritize restoration and management strategies to address existing hydrologic, water quality, in-stream habitat, and channel stability problems.
3. Determine the potential for future hydrologic, water quality, in-stream habitat, and channel stability problems.
4. Develop recommendations for management and protection strategies that will prevent and/or minimize future problems.

The major components of the Assessment Phase included analysis of natural and man-made watershed characteristics and their influence on the hydrologic and sediment regime of the watershed; geomorphologic stream assessment; subwatershed reconnaissance and analysis; ecological assessment of habitat and biological communities; water quality modeling; water quality monitoring; and problem identification and prioritization. The Planning Phase of the project focused on identifying and prioritizing Best Management Practices (BMPs) to address the problems identified in the subwatersheds and along the main stem of Quittapahilla Creek. This included a comprehensive evaluation and prioritization of general, as well as site specific BMPs for controlling agricultural and urban runoff; and a comprehensive evaluation of general, as well as site specific restoration measures to correct stream stability and habitat problems. In addition, county, city and township land use, land development, environmental, and resource protection policies and programs were evaluated. Recommendations were developed for policies and programs focused on stream, wetland and floodplain protection and management.

The results of the assessment determined the following

- Upper Quittapahilla Creek, the Unnamed Tributary draining South Lebanon, and Brandywine Creek have been severely affected by channel alterations. A significant length of the channels in this area have been piped or converted to concrete or gabion-lined flumes. These flood mitigation works have created channels that are devoid of habitat.
- Conditions along the mainstem Quittapahilla Creek from the downstream end of the Hazel Dike to its confluence with Swatara Creek are generally characterized by overwide channels with lateral erosion, high sediment supply, and vertical instability (i.e., aggradation). Lateral and mid-channel bars, riffles embedded with fine sediments, debris jams, poor water quality and in-stream habitat are common along the creek.
- The runoff from the high percentage of impervious surfaces in the urban areas has contributed to increased water temperatures and high levels of nitrate-nitrogen, conductivity, suspended and dissolved solids, turbidity, total nitrogen, total Kjeldahl nitrogen, total phosphorus, ortho-phosphate, alkalinity, hardness, copper, and lead. The extremely high levels of these constituents are indicative of pollution caused by urban runoff from the City of Lebanon the Towns of Cleona and Annville, discharges from the Lebanon WTP,
- The most significant impacts in the subwatersheds are associated with agricultural practices. In particular, unrestricted livestock grazing along the tributaries has directly impacted channel morphology by trampling of the banks, widening of the channel, and increasing sedimentation. More than 25% of the channel lengths along Bachman Run, Beck Creek, Gingrich Run and Killinger Creek have been impacted by livestock grazing. In addition historic vegetation control practices have contributed to the loss of much of the woody vegetation from the banks and riparian zone along the creeks.
- Additional impacts are associated with runoff from cropland. The water quality modeling showed that the total annual sediment loadings are highest for those subwatersheds with a higher percentage of cropland, ranging from 1,214,073 to 3,909,466 lbs/year.

- Streambank erosion is a major contributor to sediment loadings in the subwatersheds with Snitz Creek – 208,400 lbs/year, Upper Quittapahilla Creek – 187,00 lbs/year, Killinger Creek – 148,100 lbs/year, Bachman Run – 72,900 lbs/year and Beck Creek – 72,700 lbs/year, ranking first through fifth, respectively.
- The significant runoff from urban and agricultural land, high sediment supply, lack of riparian vegetation, and channel alteration have resulted in increased water temperature, shallow pools, embedded riffles and a general lack of in-stream habitat. This is reflected in the water quality monitoring results, in-stream habitat evaluation and the survey of biological communities along the mainstem Quittapahilla Creek and its tributaries.

As noted, the Quittapahilla Watershed Restoration and Management Plan (2006) included BMPs identified for controlling runoff from urban land and agricultural land, as well as projects focused on streambank stabilization and riparian buffer plantings along unstable stream reaches of the mainstem Quittapahilla Creek and its major tributaries. However, the QWA was working under the assumption that they would spearhead the stream/riparian restoration efforts while the City of Lebanon and the other Townships in the watershed would move forward with implementation of the urban BMPs. They also assumed that USDA-NRCS and the Lebanon County Conservation District would take the lead on implementing agricultural BMPs.

At the time the Restoration and Management Plan was prepared, deadlines for meeting MS4 requirements were still years away for the City of Lebanon and the other Townships in the watershed. Undeterred, the QWA resolved to move forward with implementation of the stream restoration projects identified in their Restoration and Management Plan. Utilizing Growing Greener and Fish and Boat Commission Grants, the QWA proceeded with designing, permitting and construction of restoration projects and stormwater BMPs along the mainstem Quittapahilla Creek. As they moved forward they found that the competition for limited statewide funding was the major obstacle hindering their restoration efforts. The QWA determined that they would seek other funding sources. In order to qualify for 319 funding, they decided to prepare the USEPA required Watershed Implementation Plan (WIP).

Funded by a 2016 Growing Greener Grant, the first steps in developing the USEPA Approved WIP were initiated in March 2017 and involved bringing the QWA members and representatives of local municipalities up to speed on what was involved in the original Quittapahilla Creek Watershed Assessment, what had been accomplished since the completion of Quittapahilla Watershed Restoration and Management Plan, and what remained to be done to prepare a Watershed Implementation Plan. In addition, the QWA formed working committees for each WIP task.

Utilizing the original list of restoration projects from the Restoration and Management Plan, a preliminary projects list was prepared for the Prioritization Committee to review. Each project reach within the four major tributary subwatersheds was evaluated relative to its contribution to pollutant loadings from streambank and streambed erosion based on the results of the original

2003/2004 water quality modeling and monitoring, as well as observations recorded during the field reconnaissance surveys conducted at that time. Projects that fell outside of the QWA's ability to control the outcome, such as those involving removal of concrete flumes, bank stabilization in quarries and on golf courses were dropped from the list.

The Committee prioritized the four tributary subwatersheds in descending order, with Snitz Creek being the highest priority, Killinger Creek second, Beck Creek third and Bachman Run fourth. It was agreed that projects would be completed by priority subwatershed starting at the top of the watershed and working in a downstream direction. Projects representing severe conditions and contributing high sediment loadings would warrant moving out of order.

The WIP also includes a detailed monitoring plan to evaluate the success of the projects in meeting the water quality and habitat objectives of the WIP. QWA and DFTU agreed to assume responsibility for maintenance of individual restoration projects. The WIP also outlines how the QWA will track projects and continue their current public outreach and education efforts to enlist support for and promote public participation in the restoration of the Quittapahilla Creek Watershed.

The WIP document was submitted for USEPA and PADEP review and approval on September 7, 2018. USEPA and PADEP comments were received in September 2020. Minor revisions to the document were made to address their comments and the Updated WIP was submitted on January 27, 2021. PADEP informed the Watershed Association and their partners that the WIP had been approved by USEPA on March 3, 2021.

II. Implementation Progress

A. Successes

1. Stream and Floodplain Restoration Projects

The attached Table 1 shows the projects that have been completed as well as current projects. The Quittie Creek Nature Park Project along the mainstem Quittapahilla Creek was the first project. Implemented in two phases it was completed in 2015 and 2016. Pre and Post Construction monitoring by the PA Fish and Boat Commission documented that the project significantly improved the over stability and in-stream habitat along the 3,440 feet of creek in the Park. Successfully functioning for eight years, it was recently highlighted in Spring 2023 during a tour by participants attending the 78th Annual Northeast Fish & Wildlife Conference in Hershey, PA.

In 2019, over 1,100 feet of highly degraded stream channel along lower Snitz Creek was successfully restored. Another 1,600 feet along the mainstem Quittapahilla Creek was restored in 2023.

Between 2018 and 2024 another 6,625 feet of Beck Creek, Killinger Creek and Snitz Creek stream channel and floodplain restoration projects have been designed and permitted. Construction on these project will begin in 2025. An additional 5,275 feet of restoration projects along Snitz Creek, Bachman Run and Quittapahilla Creek are currently in the restoration design and permitting phase. All together these projects will result in 18,240 feet of restored stream channel. In addition, 10.87 acres of wetlands and more than 25 acres of riparian buffers will have been established.

Water Quality and Biological Monitoring Program

Chemical Monitoring -- Six fixed-station monitoring locations (Fig 1) have been equipped with staff plates and pressure transducers for measuring water depths. Bi-monthly water-quality samples are collected using PADEP protocols at each of these six stations and the samples are analyzed by the PADEP laboratory for nutrients, metals, major ions, hardness, total dissolved solids, and total suspended solids. The results are posted on QWA's water-quality monitoring portal at <http://147.185.239.141/qwa/>.

Biological Monitoring -- At the same fixed stations, macroinvertebrate samples are collected in the fall of each year using a modified PADEP collection protocol. The samples are picked in the field and identified by students at Lebanon Valley College.

The biological data are housed with Lebanon Valley College (Dr. Urban) and QWA does not have these data. At present, QWA's only access to the biological data is through the student reports from Dr. Urban's students. These reports are produced about once a year, but on an irregular schedule depending on when Dr. Urban has a student that wants to work on a special project.

2. Watershed Reconnaissance Surveys

As noted a major component of the overall Quittapahilla Creek Watershed Assessment conducted between 2003 and 2004 was Field Reconnaissance Surveys of 65 miles of the five major tributaries to Quittapahilla Creek. The data collected during these surveys was utilized to identify problem areas and potential restoration projects in the subwatersheds. That data is now twenty years old.

In 2017, the Quittapahilla Watershed Association began conducting Field Reconnaissance Surveys of the subwatersheds to document current stream reach conditions and determine the continued need for restoration/stabilization along the subwatershed reaches.

These surveys have been conducted by college students serving as summer interns funded by grants secured by the QWA and more recently funded by the Lebanon County Conservation District and trained by Clear Creeks Consulting. The focus of the 2017 assessments was the stream reaches in the Snitz Creek subwatershed. Similar assessments were conducted during summer 2018 and 2019 along Beck Creek and Bachman Run subwatersheds, respectively. COVID prevented internships for 2020 and 2021. Funding was not available in 2022. Summer of 2023 the interns surveyed Gingrich Run and Killinger Creek subwatersheds. Later in the Summer the

survey was expanded to include the Snitz Creek subwatershed. This Summer the survey focused on the Beck Creek and Bachman Run subwatershed stream reaches..

B. Factors Slowing Progress

As noted, the Snitz Creek subwatershed was identified as the highest priority based on the results of water quality modeling, water quality monitoring and observations recorded during the subwatershed reconnaissance surveys conducted as part of the original watershed assessment. Implementation of the Snitz Creek Projects Schedule outlined in the approved WIP has been slowed by a number of factors.

1. Landowner Participation

In the process of implementing the prioritized projects over the last several years, the partners have found that not all landowners want to participate in the restoration effort. Unfortunately, this has left gaps, at least for now, in the logical implementation sequence they intended to follow.

While some landowners have recognized the benefits of having the stream along their property restored and participated eagerly. Other landowners have required compensation to allow a project on their property. For example, in the case of Snitz Creek 2 Stream and Floodplain Project, negotiations between Cornwall Borough and the landowner took two and one half years to complete before the project could move forward.

2. Slipping Back Into the Project By Project Approach

A number of landowners along downstream reaches in the Snitz Creek subwatershed, as well as landowners from other subwatersheds have expressed an interest in participating in the restoration effort. Sticking with the WIP implementation schedule would mean some landowners would be waiting for many years before the Partners would actually reach their property. After consulting with Jineen Boyle and Scott Carney, PADEP the Partners were encouraged to continue following the WIP implementation schedule, but not to discourage or turn away landowners interested in participating, provided they were in a priority subwatershed, and their property included a prioritized stream reach.

Unfortunately, this has resulted in a project implementation pattern similar to the old project-by-project approach. In addition, it has caused some of DEP's grant coordinators to complain that the Partners are not following the WIP implementation schedule. This can and has affected the competitive advantage of otherwise worthwhile projects.

3. Funding Sources and Competition

As noted, the Partners were initially working with funding from PA DEP Growing Greener and PA Fish and Boat Commission Grants. In 2018 funding for projects became available from onetime Water Quality Improvement Project (WQIP) along the Mariner East 2 Pipeline Corridor grants. With the approval of the WIP in 2021, funding became available from PADEP/USEPA 319 grants.

In the last several years the State and Federal agencies have provided additional funding sources to assist Pennsylvania in meeting its obligations to the Interstate Pact targeting pollutant reductions for the Chesapeake Bay. These have included Countywide Action Plan (CAP) and Agricultural Conservation Assistance Program (ACAP) grants through LCCD, and Watershed Restoration and Protection grants through the PA Department of Community and Economic Development (DC&ED). Some additional funding is periodically available through the National Fish and Wildlife Foundation and The Conservation Fund. Partnering with municipalities, such as Cornwall Borough, seeking to meet their MS4 credit requirements has supplemented the funding from other sources.

This increase in funding sources would seem to provide more than adequate funding for reaching the Quittapahilla Creek Watershed restoration goals in a reasonable timeframe. However, competition for the funding has increased exponentially over the last decade as other watershed organizations and municipalities have developed and begun to implement their Restoration Action Plans, TMDL Implementation Plans, Pollutant Reduction Plans and Alternate Restoration Plans.

Funding from PA DEP Growing Greener, US EPA 319 and DC&ED Watershed grants is distributed across the entire state. Competition for specific grants from National Fish and Wildlife Foundation funding is usually on a regionwide basis. Because each Conservation District receives an allotment of money each year, competition for CAP and ACAP grants is restricted to projects in Lebanon County. However, those funds are split between Agricultural BMPs and Watershed Restoration Projects, that is stream and floodplain restoration. The funds may also be split between any projects proposed in any one of the twenty five subwatersheds in Lebanon County.

4. Evaluating Project Implementation Costs

When reviewing funding requests, experience has shown that not all PA DEP and US EPA grant reviewers evaluating our projects have a firm understanding of project costs or the project elements that drive those costs..

Stream and river restoration refers to a broad spectrum of activities. With increasing levels of complexity and work effort these activities can include riparian buffer plantings, in-stream habitat improvements, streambank stabilization, stream channel reconfiguration to reestablish meanders along previously channelized reaches, stream channel relocation/reconfiguration and floodplain restoration.

We have found that most grant reviewers evaluate project costs on a per linear foot basis. I don't think anyone would argue that the work effort and costs for design, permitting and construction would vary considerably over the range of restoration activities presented above. Still, it is worth considering that evaluating more complex projects on an overall cost per linear foot basis does not, cannot, take into account the work effort and costs associated with the various design elements incorporated into a channel relocation/reconfiguration, floodplain restoration and wetland creation type of project. If considered on a cost per linear foot basis, typical construction costs for these types of projects in neighboring Maryland run between \$300 and \$450 per linear foot.

A more appropriate method to evaluate the overall cost of projects would involve determining the work items associated with a particular project element and comparing the cost of a given work item with the cost of that same work item for other restoration projects. For example, what is the contractor charging per cubic yard of Class 1 Excavation to construct a wetland area or Class 5 Excavation to construct a new stream channel. The cost per cubic yard multiplied by the total cubic yards moved is a straight forward and reasonable way to compare project costs. Doing that for each element and its associated work items eliminates the guesswork associated with the overall cost per linear foot method, providing a comparative analysis based on standard, industry-wide construction cost estimating methods.

Another aspect of the cost of project implementation that is often overlooked is the effect of inflation. The Beck Creek 6 Project provides an excellent example of how this can affect our projects. In June 2022 DFTU submitted a funding request through the 319 grant program. The grant was denied based on the high cost. When contacted about the funding denial letter our PADEP Grant Coordinator, Scott Heidel indicated that an analysis of other similar projects conducted by PADEP and USEPA staff concluded that this project could be completed for \$140,000 or \$70 per linear foot. He further stated that the Project should have been competitively bid to Construction Contractors, such as, Aquatic Resource Restoration Company (ARRC) and Ecotone because PADEP believes they submit reliable construction costs.

In fact, DFTU had put the project out for competitive bids. The following Construction Costs were based on the bids submitted by the Construction Contractors competing for this project.

- Resource Restoration Group, LLC - \$716,894 (Selected Contractor)
- Aquatic Resource Restoration Company (ARRC) - \$838,247
- Ecotone Ecological Restoration - \$989,429
- Baltimore Pile Driving and Marine Construction, Inc - \$1,379,727

When confronted with these facts he had no response.

In June 2023 DFTU submitted a second funding request through the 319 grant program. Due to inflation the construction costs for the exact same Beck Creek 6 Project had jumped to \$874,935. An increase of \$158,041 or 22%.

C. Final Thoughts

Some important takeaways include:

1. Project costs are increasing significantly.
2. Funding is limited and competition is intense.
3. Identifying additional funding sources is critical.
4. Worthwhile projects that do not follow the implementation schedule in their approved plans are at a competitive disadvantage.
5. Implementation schedules represent a multi-year effort. Alternating between subwatersheds will significantly extend the time necessary to realize observable and quantifiable benefits of the restoration efforts in any given subwatershed.
6. With partners working in multiple watersheds, it is imperative that a strategy for funding and implementing projects in all of these watersheds be developed and agreed upon by all parties.