# FLETCHER RUN REDESIGNATION PETITION

**Water Quality, Stream Habitat, and Benthic Macroinvertebrate Survey Data**
**In Support of**
**Redesignation of Fletcher Run from a High-Quality Warm Water Fishes to a Warm Water Fishes Classification**

**Richhill Township, Greene County, Pennsylvania**

**Petitioner:**

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**CEC Project 330-997**

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# 1.0 INTRODUCTION

Fletcher Run, a tributary to Grays Fork, is located in Richhill Township, Greene County, Pennsylvania (Figure 1). The upper portion of South Fork Tenmile Creek (Basin, source to Browns Creek), which includes Fletcher Run (DEP stream code 40702) is currently designated as having a High-Quality Warm Water Fishes (HQ-WWF) aquatic life use by Pennsylvania Department of Environmental Protection (Department) Regulations (Pennsylvania's *Water Quality Standards*, Title 25 Pa. Code § 93.9v, 2023a). According to Department personnel, some streams were given designated uses in the 1970s with limited empirical information. Chapter 23 of the Department's regulations describes the processing of petitions, evaluations, and assessments to change a designated use. Based on data collected in Fletcher Run in 2019-2020, Consol Pennsylvania Coal Company LLC (CPCC) would like to petition the Department to change the designated aquatic life use of Fletcher Run from HQ-WWF to Warm Water Fishes (WWF).

Civil & Environmental Consultants, Inc. (CEC) was contracted by CPCC to perform biological and chemical (water quality) studies to support a change in the designated use of Fletcher Run. This report presents the results for monthly surface water sampling performed in Fletcher Run from May 2019 through April 2020. Water sampling was performed on an Exceptional Value (EV) reference stream, Limestone Run in the Dunbar Creek watershed in Fayette County, in March and May 2019, and March 2020. Benthic macroinvertebrate sampling was performed at two locations on Fletcher Run, and one location on Limestone Run in May 2019 and March 2020.

Background information, site description, sampling methods and data analysis, results and discussion, conclusions, and references are presented in sections 2 through 7, respectively, of this report.

## 2.0 BACKGROUND

This section provides a chronological summary of events associated with the designation of Fletcher Run as a HQ-WWF stream.

Fletcher Run, as part of the upper South Fork Tenmile Creek watershed, was assigned a HQ-WWF designation by the Department in 1979 based on a desire to "protect the Waynesburg water supply and excellent smallmouth bass fishery". No in-stream data were collected, and no technical support document was issued detailing the basis for designating South Fork Tenmile Creek, and its headwater streams, as HQ-WWF.

The Department performed biological sampling at two locations in the upper section of South Fork Tenmile Creek in 1983 and applied those results throughout the upper watershed (including Fletcher Run). Sampling results at one station on South Fork Tenmile Creek included 27 benthic macroinvertebrate taxa being identified, and no issues were observed regarding water quality. The Department concluded that this waterway in 1983 continued to qualify as HQ based on the observed biological condition.

In 2003, the Department issued Technical Guidance Document No. 391-0300-002, "Water Quality Antidegradation Implementation Guidance". The purpose of this document is "to provide guidance to DEP staff and aid the regulated community and the public in understanding the implementation of the Antidegradation Program in Pennsylvania".

The Department sampled Fletcher Run at one location in March 2009. Results for that sampling event indicated that Fletcher Run was not meeting HQ status. The Department has apparently not sampled Fletcher Run since March 2009 based on data posted on the Macroinvertebrate Taxa Viewer on the Department's GIS website (DEP 2023b).

According to Title 25, Chapter 23, a petition requesting redesignation of a stream must include the elements below. Each element is followed in parenthesis by the location where that element can be found in this report.

- A clear delineation of the watershed or stream segment to be redesignated both in narrative form and on a map (see Section 3.0 and Figures 1 and 3).
- The current designated use of the water from the applicable Drainage List in Chapter 93 (Fletcher Run is a tributary to Grays Fork and the South Fork Tenmile Creek, which is listed as a HQ-WWF in § 93.9v, see Section 1.0).
- The requested designated use (Fletcher Run as a WWF, see Sections 1.0 and 5.0).
- Available technical data for water chemistry, the aquatic community, and in-stream habitat (see Section 5.0).
- Descriptions of existing point and non-point source discharges and their impact(s) on water quality and the aquatic community (see Sections 3.0 and 5.0).
- Information regarding the qualifier for designation as a HQ water and how the watershed does not satisfy this qualifier (see Section 5.0).
- A general description of the land use and development patterns in the watershed (see Section 3.0 and Figure 5).
- The names of all municipalities through which the watershed or segment flows, including official contact names and addresses (see Section 3.0); and,
- One or more maps that graphically show the information listed above (See Figures 1, 3, and 5).

## 3.0 SITE DESCRIPTION

CPCC is requesting that Fletcher Run (Stream Code 40702), from its headwaters to its confluence with Grays Fork (a length of approximately 1.4 miles) be redesignated from HQ-WWF to WWF based on water chemistry, aquatic community, and in-stream habitat information presented in Section 5.0 of this report. Grays Fork, a tributary to South Fork Tenmile Creek, is currently designated as having a HQ-WWF aquatic life use by the Department Regulation (Title 25 Pa. Code § 93.9v, 2023a). The WWF protected use is defined as "maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat." Fletcher Run is listed as attaining the aquatic life use designation in the most recent 305(b)/303(d) stream listing (DEP, 2022). However, the biological evaluation upon which this attaining designation was originally based appears to have been performed by the Department in 1999. The more recent March 2009 evaluation of Fletcher Run by the Department does not support the attaining designation.

Fletcher Run is located in Richhill Township, Greene County and the municipal contact information is as follows:

**Mr. Charles R. Kiger**
**Board of Supervisors**
Richhill Township Municipal Building
109 Municipal Lane
Wind Ridge, PA 15380

Phone: 724-428-4465
Fax: 724-428-3216
Email: richhilltwp@windstream.net

Fletcher Run is in a watershed covering approximately 417 acres (Figure 5). The predominant land uses in the watershed are crop/pasture/orchards/groves (61.1%, 254.4 acres), mixed forest (20.0%, 83.5 acres), mixed rangeland (13.8%, 57.4 acres), extraction (3.6%, 15.2 acres), and Other Urban Built-Up (0.3%, 1.3 acres). The residential cover area (typically single-family housing units) is low (1.2%, 4.9 acres) within the watershed. The watershed uses described

above, obtained from the most recent Southwestern Pennsylvania Commission Land Use/Land Cover data set (2015) are supported by visual observations by CEC field personnel.

No point source discharges have been identified within the Fletcher Run watershed (U.S. EPA Permit Compliance System Search; February 27, 2023). Furthermore, CEC personnel have not observed any point source discharges within the watershed during field collection activities. Based on CEC field observations, the non-point source discharges within the watershed are primarily agricultural (farming, crops, and cattle). Homes in the Fletcher Run watershed are likely on-lot septic, as municipal water and sewage lines have not been installed along Fletcher Run Road, which parallels Fletcher Run.

Limestone Run (Stream code 38199 – Figure 2) flows into Dunbar Creek (Stream code 38164), which flows into the Youghiogheny River, a tributary of the Monongahela River. Dunbar Creek and its tributaries, in Fayette County, Pennsylvania, from its source down to the confluence with Gist Run is listed as having a High-Quality Cold-Water Fishes (HQ-CWF) designated use for the protection of aquatic life (Title 25 Pa. Code, Chapter 93, § 93.9v). However, Dunbar Creek from its source down to Elk Rock Run, which includes Limestone Run, has an existing use of Exceptional Value (EV) based on a January 2003 evaluation by the Department. Limestone Run has been sampled by Department biologists for benthic macroinvertebrates eight times between 2006 and 2015 (PADEP GIS Mapping Tools-Macroinvertebrate Taxa Viewer, 2023b).

The Limestone Run watershed at CEC Station LR-1 covers approximately 1,590 acres (Figure 6). The predominant land use in the watershed is mixed forest (95.6%, 1,520.1 acres). Minor land uses include crop/pasture/orchards/groves (2.1%, 33.4 acres), residential (2.1%, 33.0 acres), and commercial and services (0.2%, 3.5 acres). The watershed uses described above, obtained from the Southwestern Pennsylvania Commission Land Use/Land Cover data set (2015) are supported by visual observations by CEC field personnel.

# 4.0 SAMPLING METHODS AND DATA ANALYSIS

## 4.1 SAMPLING STATIONS

CEC established two stations, each 100-meters (328-ft) long, for water quality and benthic macroinvertebrate sampling on Fletcher Run (stations FR-1 and FR-2 – Figures 1 and 3). CEC station FR-1 was established close to the Department's benthic macroinvertebrate station sampled in March 2009. At station FR-2, monthly water samples (May 2019 through April 2020) were consistently collected at a pool near the upstream end of the station. Due to access restrictions, water samples were only collected at the FR-1 benthic sampling station three times, on May 9 and June 26, 2019, and March 18, 2020. Water sample collection was performed at the Alternate FR-1 water sampling location (Figures 1 and 3) for the nine other monthly water sampling events.

CEC established one station for water quality and benthic macroinvertebrate sampling on the EV reference stream, Limestone Run (station LR-1 – Figures 2 and 4). This station was located at the same location previously sampled by the Department in 2015. Although it has a larger watershed size than Fletcher Run, it is still considered a first-order stream. Water samples were collected from a pool within the station on three dates (March 28 and May 8, 2019, and March 16, 2020).

The sampling reach at each station was measured and marked by CEC at the start of the initial survey to indicate the upstream and downstream limits for the benthic macroinvertebrate sampling. The GPS coordinates (latitude/longitude) for each sampling station were recorded using a Trimble GeoXT unit (Table 1).

## 4.2 WATER QUALITY ANALYSIS AND HABITAT ASSESSMENT

Title 25 Pa. Code, Section 93.4 b of the antidegradation regulation describes the chemical and biological requirements for a surface water body to classify as High Quality (HQ). This section indicates that a stream is a High Quality Water if it meets one or more of the conditions of chemistry, biological assessment, or being designated a Class A Wild Trout Stream.

Specifically, subsection (a)(1)(i) states the following in regard to Chemistry:

> The water has long-term water quality, based on at least 1 year of data which exceeds levels necessary to support the propagation of fish, shellfish and wildlife and recreation in and on the water by being better than the water quality criteria in § 93.7, Table 3 (relating to specific water quality criteria) or otherwise authorized by § 93.8a(b) (relating to toxic substances), at least 99% of the time for the following parameters:
>
> | | |
> |---|---|
> | dissolved oxygen | total aluminum |
> | total iron | dissolved nickel |
> | dissolved copper | dissolved cadmium |
> | temperature | pH |
> | dissolved arsenic | ammonia nitrogen |
> | dissolved lead | dissolved zinc |

The water quality criteria numeric values listed in § 93.7, Table 3 apply to WWF, CWF, HQ, and EV streams. Dissolved oxygen and water temperature criteria are more stringent for CWF streams, than WWF streams. Although HQ and EV streams must meet the same water quality standards as WWF and CWF streams (except as noted), the primary difference is HQ and EV streams must meet the requirement for long-term water quality for the parameters listed above.

To address the chemical requirement, CEC collected field water chemistry measurements (water temperature, pH, dissolved oxygen, and electrical conductivity and specific conductance as indicators of total dissolved solids) and water samples at the Fletcher Run sampling stations on a monthly basis from May 2019 through April 2020. The established EV stream, Limestone Run, was not sampled monthly, but was sampled for field and laboratory water chemistry three times, in March 2019, May 2019, and March 2020.

Field measurements were collected using a handheld YSI Model 556 or Professional Plus meter, which was maintained, operated, and calibrated per the manufacturer's instructions. During this 12-month period, a total of 24 sets of water samples were collected from Fletcher Run, with 12 sample sets collected per stream sampling station (or alternate). During each water sampling event, the stream flow rate was measured and calculated for each station using the U.S.

Geological Survey velocity-area method (Nolan and Shields 2000, Carter and Davidian 1968, Buchanan and Somers 1968). Velocity was measured across a representative stream cross-section with a uniform bottom and laminar flow using a calibrated Marsh-McBirney Model 2000 Flo-Mate™ velocity meter.

Grab surface water samples were collected by CEC for chemical analysis during each monthly sampling event. Sample bottles were labeled with the CEC project number, stream name, station number, analysis parameter(s) and preservative, sampler, date, and time. The sample bottle for inorganic ions was not preserved. The sample collected for dissolved metals analysis was filtered (0.45-micron filter) in the field and immediately fixed with nitric acid ($HNO_3$). The total metals sample was also fixed in the field with $HNO_3$. Sample bottles for analysis of ammonia-nitrogen and total phosphorus were fixed with sulfuric acid preservative. One fecal coliform sample bottle was filled at each station, then sealed, and placed on ice. To meet the required holding time, fecal coliform samples were hand delivered directly to Environmental Service Laboratories, Inc., (ESL) in Bentleyville, Pennsylvania, on the day of sampling along with the completed chain-of-custody form.

All other filled sample bottles were immediately placed on ice in a cooler, and a chain-of-custody form was filled out when sampling was completed. The signed chain-of-custody form was placed in a waterproof plastic bag within the cooler containing ice, which was sealed with clear tape. A signed custody seal was placed on the cooler lid. The water sample cooler was picked up the next morning at CEC by a courier from Eurofins TestAmerica Laboratories, Inc. (TestAmerica), located in Pittsburgh, Pennsylvania.

The water samples were analyzed in the TestAmerica laboratory for the following parameters specified under § 93.4b(a)(1): ammonia nitrogen, total iron, total aluminum, dissolved arsenic, dissolved cadmium, dissolved copper, dissolved lead, dissolved nickel, and dissolved zinc. Additional parameters analyzed included total dissolved solids, total alkalinity, hardness (= 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L]), chloride, total phosphorus, nitrate-nitrogen, and dissolved selenium. The laboratory analysis reports and associated quality assurance/ quality control information are presented as Appendix B in this redesignation petition.

The Department's 2003 guidance states that the water quality data must be adjusted in a way that allows for comparison to the acute and chronic parameters listed in Title 25 Pa. Code Section 93.4b(a)(1) (See parameters listed on page 7). The data are evaluated using statistically based formulas developed by the United States Environmental Protection Agency (USEPA, 1991) to determine whether the sampling data show that the quality of the water is better than the acute and chronic criteria 99% of the time. To provide protection for aquatic life, it is necessary to consider both acute or short-term exposure response (survival) and chronic or long-term processes such as reproduction, growth, and survival. To perform this evaluation, the mean (m), standard deviation (SD), and coefficient of variation (CV = SD/m) must be determined for the data sets (e.g., Fletcher Run, Tables 2 and 3, respectively). The CV for the data set is then compared to the 99$^{th}$ percentile (P99) acute (AFC) or chronic (CFC) multiplier(s) derived by USEPA (1991, Table 5-1). Next, the mean of the data set for an individual parameter is multiplied by the AFC or CFC multiplier(s) to estimate the P99 for the AFC and/or CFC concentrations which are compared to the appropriate criterion for a parameter. According to Department (2003) guidance, if the P99 concentration for the data set is better than the criteria by one significant figure, the test has been passed for that specific parameter. Furthermore, the Department states that *all* parameters listed in Section 93.4b(a)(1) must pass the test for the stream to qualify as HQ on a chemical basis.

Stream physical characteristics and basic field water quality parameters were measured, and a Riffle-Run Prevalence Habitat Assessment (DEP 2003) was performed at each sampling station in conjunction with the May 2019 and March 2020 benthic macroinvertebrate surveys (Appendix C – Field Data Sheets). Stream physical measurements included wetted width, and maximum and minimum riffle-run and pool depths within the 100-m sampling reach at each station.

The Department's Riffle-Run Prevalence Habitat Assessment included observations and scoring (from 1 to 20) for twelve habitat parameters including in-stream cover, epifaunal substrate, embeddedness, velocity/depth regimes, sediment deposition, channel flow status, channel alteration, frequency of riffles, condition of banks, bank vegetative protection, grazing or other disruptive pressure, and riparian zone width (Appendix C – Field Data Sheets).

Narrative categories are assigned to the ranges of habitat assessment scores shown in the following columns:

| Narrative Category | Scoring Range |
|---|---|
| Optimal | 240-192 |
| Sub-optimal | 180-132 |
| Marginal | 120-72 |
| Poor | 60-20 |

Intermediate scores that fall between the ranges shown above are evaluated based on the best professional judgment of the investigator.

## 4.3 BENTHIC MACROINVERTEBRATE SAMPLING AND DATA ANALYSIS

### 4.3.1 Field Sampling Methods

CEC biologists performed benthic macroinvertebrate sampling at the two sampling stations located on Fletcher Run and the Limestone Run station during two separate sampling events, on May 8-9, 2019, and March 16 and 18, 2020. Field data sheets completed for each sampling station include a sketch showing the location of riffle/run and pool habitats (Appendix C).

CEC collected one benthic macroinvertebrate sample at each sampling station in accordance with the Department Protocol, *A Benthic Macroinvertebrate Index of Biotic Integrity for Wadeable Freestone Riffle-Run Streams in Pennsylvania*, dated March 2012. This method, which matches the field sampling method from the Department's Anti-degradation Guidance (PADEP 2003), consisted of collecting one composite sample per station by performing six separate 1-$m^2$ kicks in riffle/run habitats by disturbing the substrate directly upstream of a D-frame kick net (500-micron mesh) positioned on the stream bottom. The benthic macroinvertebrates and substrate swept into the open net during each kick were immediately transferred into a benthos bucket with a 500-micron mesh sieve bottom. The six kicks were performed within the limits of the 100-meter sampling reach. Dominant substrate particle size, depth, water velocity (slow vs. fast),

and cover information were recorded for the six discrete sampling points on a benthic macroinvertebrate field data sheet (Appendix C).

Once all six D-frame kicks were collected, the material in the sieve bucket was transferred into a one-gallon plastic sample container, preserved with 95% ethanol, sealed, labeled, then placed into coolers for transport back to the CEC lab.

### 4.3.2 Benthic Sample Laboratory Processing and Analysis

The benthic macroinvertebrate samples were returned to the CEC Aquatics laboratory for sorting and identification. Processing and analysis of benthic macroinvertebrate samples collected during the sampling events conducted in May 2019 and March 2020 followed the laboratory protocol described in DEP (2012). Each benthic macroinvertebrate sample was sorted following this protocol to form a 200-organism (±20%) subsample. Organisms in the subsample were identified primarily to genus taxonomic level. Oligochaetes (aquatic worms) and Turbellaria (flatworms) were identified to class taxonomic level. Chironomidae (midge fly larvae), snails, and clams were identified to family taxonomic level. Macroinvertebrates were identified using current taxonomic references identified in Ohio EPA (2019) or primary references identified in Section IX, Taxonomy Reference List of the Department's (2006) *Standardized Biological Field Collection and Laboratory Methods*. The number of organisms per taxon was enumerated and recorded on laboratory bench sheets for each sample. All identified macroinvertebrates were stored in labeled sample vials containing 70 percent ethanol solution and archived for future reference.

### 4.3.3 Benthic Macroinvertebrate Data Analysis

The benthic macroinvertebrate data obtained for each 200 ±20% subsample was analyzed using two different methods. First, a benthic Index of Biological Integrity (IBI) score was calculated for each subsample using the six metrics identified in DEP (2012). Second, the samples from Fletcher Run stations were individually compared to the Limestone Run sample using the five antidegradation metrics presented in the Department's guidance (DEP 2003). This evaluation

determined whether Fletcher Run samples were meeting HQ or EV status based on the comparison to EV stream Limestone Run. The methods and individual metrics used for these two methods are presented in the following sections.

#### *4.3.3.1 Wadeable Freestone Riffle-Run IBI Analysis*

The following biological metrics and biological scores from the Department's Freestone Riffle-Run IBI protocol were calculated for the benthic samples for both sampling events. This method requires a minimum of 160 benthic organisms in the sample (or subsample) to complete the metric analysis. EPT taxa in Metric 2 refers to those taxa within the aquatic insect orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), which are generally considered most sensitive to environmental stress.

| *PA Freestone Riffle-Run IBI metrics* |
|---|
| 1. Total Taxa Richness |
| 2. EPT Taxa Richness [EPT taxa with Pollution Tolerance Value (PTV) of 0-4] |
| 3. Beck's Index, Version 3 (taxa with PTV of 0-2) |
| 4. Hilsenhoff Biotic Index |
| 5. Shannon Diversity Index |
| 6. Percent Sensitive Individuals (taxa with PTV of 0-3) |
| **IBI Score** |

DEP (2012) states that, "any sample from an HQ or EV stream that scores less than 63.0 on the IBI will be considered impaired without compelling reasons otherwise (e.g., a stream was designated HQ or EV for a reason other than assessment of the benthic macroinvertebrate community such as Exceptional Ecological Significance and other EV qualifiers in §93.4b(2)(b))." This benchmark score of 63.0 applies to samples collected during the sampling period between November and May.

#### *4.3.3.2 Antidegradation Analysis*

CEC performed analyses on the benthic macroinvertebrate data compiled from the May 2019 and March 2020 surveys using the five recommended metrics identified in DEP (2003). These

five metrics were selected by the Department because they had the best discriminatory power in differentiating EV and HQ streams. It should be noted that the selection of these five metrics was based on their application to benthic data from coldwater stream habitats. The Department has not developed WWF-based benthic metrics to date. The application of these five CWF-based benthic metrics to HQ-WWF candidate streams has not been tested by the Department. However, because the CWF-based metrics are the only published metrics from the Department, they were used for the analysis of benthic data from HQ-WWF designated Fletcher Run to the cold-water reference stream Limestone Run, selected by CEC for the purposes of this report.

The following five metrics identified in DEP (2003) are summarized below:

1) Taxa Richness = Total number of taxa within the subsample.
2) Modified EPT Index = Total number of Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies) taxa minus EPT genera considered to be pollution tolerant (Pollution Tolerance Values > 4).
3) Percent Dominant Taxon = The percent of the total abundance made up by the single most abundant taxon.
4) Percent Modified Mayflies = The percent of the total abundance made up by mayflies with Pollution Tolerance Values ≤ 4).
5) Modified Hilsenhoff Index (HBI) = This index reflects macroinvertebrate tolerance to organic pollution, with zero the least tolerant and ten the most tolerant.

Generally, metrics 1, 2 and 4 are characterized as reflecting improvement in water quality as the metric values increase, while metrics 3 and 5 are characterized as reflecting degradation in water quality as the values obtained for those metrics increase. However, on some occasions, the dominant taxon (metric 3) can be a pollution intolerant taxon (tolerance value ≤3), which would not be reflective of degraded water quality.

Initially, values are calculated for all five of these metrics for each sample (both candidate and reference streams) using the benthic data. In this instance, benthic samples from Fletcher Run are candidate stream samples, and Limestone Run is the reference stream. Each metric has a

different scoring scale (e.g. Modified Hilsenhoff Index values range from 0 to 10, and Percent Dominant Taxon ranges from 0 to 100 percent). Therefore, scores must be converted to the same scale by normalizing the scores prior to making metric comparisons between candidate and reference sites.

Appendix A, Section 4 (Metric Scoring and Selection) of DEP (2003) provides a table with Biological Condition Scoring Criteria for the five metrics based on comparison of candidate and reference station metrics. A Biological Condition Score ranging from 0 to 8 (highest or best score) is calculated for each metric based on a comparison of the candidate metric value to the reference metric value. The difference between candidate and reference metrics are expressed as a percentage for the taxa richness and modified EPT metrics. The difference between candidate and reference metric values are expressed as a difference, rather than a percentage, for percent dominant taxon (candidate minus reference), percent modified mayflies (reference minus candidate) and Modified Hilsenhoff Index (candidate minus reference). Each metric has equal weighting, and the five scores are summed to obtain a total score, with a maximum score of 40.

The last step in the process is to calculate the candidate stream total score, divide this score by 40 and multiply by 100 to obtain a percentage. The following table determines the anti-degradation status of the stream according to the percentages shown in the following table.

| **% Comparison of Candidate Stream to Reference Score** | **Stream Classification Category** |
|---|---|
| ≥92% | Exceptional Value (EV) |
| 83-92% | High Quality (HQ) |
| <83% | Existing Use or designated use (Non-HQ or EV) |

Therefore, Fletcher Run samples must attain a minimum percent comparison of 83% to the reference stream in order to be classified as HQ.

# 5.0 RESULTS AND DISCUSSION

## 5.1 WATER QUALITY ANALYSIS

### 5.1.1 Fletcher Run

Results for field water chemistry measurements collected at Fletcher Run sampling stations FR-1 (and Alternate FR-1), and FR-2 for each month from May 2019 to April 2020 are presented in Tables 2 and 3, respectively.

The mean water temperature in Fletcher Run was 8.9°C and ranged from 0.6°C in January 2020 to 19.9°C in late-August 2019 (Tables 2-3). Furthermore, water temperatures measured at both Fletcher Run stations were below the bi-monthly or monthly maximum warm water (WWF) quality criteria for 23 of 24 measurements (DEP, 2023a, Chapter 93). Only the February 20, 2020 water temperature reading of 5.0°C at Alternate FR-1 exceeded the February WWF temperature limit of 4.4°C. This one exceedance occurred under ambient conditions and was not the result of a thermal discharge to the stream.

Dissolved oxygen (DO) in Fletcher Run had a mean of 11.1 mg/L (Table 4) and ranged from 6.8 mg/L in August 2019 to 15.4 mg/L in December 2019 (Tables 2 and 3). None of the 24 measurements were below the warm water quality criteria minimum DO of 5.0 mg/L (DEP, 2023a, Chapter 93).

Field pH values in Fletcher Run ranged from 7.27 to 8.55 standard units (SU), (Tables 2 and 3). All values were within the warm water criteria range of 6 to 9.

For the laboratory-analyzed water samples from Fletcher Run, the acute and chronic P99 values for ammonia nitrogen, total iron, dissolved arsenic, dissolved cadmium, dissolved copper, dissolved lead, dissolved nickel, and dissolved zinc are better than the criteria, therefore the test has been passed for these parameters (Table 4).

However, the acute P99 value for total aluminum exceeded the Chapter 16 criteria. In reviewing the data for Fletcher Run station FR-2 (Table 4), the total aluminum concentration in the sample collected in May 2019 was 960 µg/L, which was three times higher than the next highest sample concentration (320 µg/L in August 2019). Total iron (2,000 µg/L) was also observed to be elevated in this same sample. The Chapter 93 criterion for iron (1,500 µg/L) is a monthly average concentration (Table 3), and not an instantaneous maximum concentration. In summary, Fletcher Run does not classify as HQ based on the water chemistry results for total aluminum.

Results for additional water quality parameters, not specified in 93.4 b for HQ antidegradation determination, are presented on Tables 2 and 3 for Fletcher Run stations FR-1 (and Alt FR-1), and FR-2. Fecal coliform samples collected at both stations in May, June, August, and September 2019 exceeded the 200 colonies/100 mL permissible maximum for samples collected within that period. Fecal coliform samples collected at both stations between October 2019 and April 2020 were under the 2,000 colonies/100 mL permissible maximum for that period.

### 5.1.2 Limestone Run

Results for field water chemistry measurements and laboratory analysis of water samples collected on three separate dates at sampling station LR-1 on Limestone Run are presented on Table 5. Water sample collection on May 8, 2019, and March 16, 2020, coincided with the benthic macroinvertebrate sampling on Limestone Run, which coincided with the water sampling and benthic macroinvertebrate sampling performed on Fletcher Run. The March 28, 2019, water sample results are not associated with a sampling event on Fletcher Run, but provide an additional set of water chemistry data for this EV reference stream.

Review of the data presented on Table 5 indicates that no water quality parameters exceeded the Chapter 93 or Chapter 16 criteria for the three sampling events. Field specific conductance (range 52 to 71 µS/cm), total dissolved solids (range 25 to 38 mg/L), total alkalinity (7.6 to 10 mg/L), and total hardness (20 to 22 mg/L) were all very low. Total metal concentrations were less than the water quality criteria and dissolved metals meet the acute and chronic Chapter 16 criteria adjusted for a mean hardness of 21 mg/L. The maximum fecal coliform count was 15

colonies/100 mL (May 8, 2019), which was below the permissible limit of 200 colonies/100 mL for May.

## 5.2 STREAM PHYSICAL CHARACTERISTICS AND HABITAT ASSESSMENT

### 5.2.1 Fletcher Run and Limestone Run

Table 6 provides field water chemistry, stream physical characteristics, and habitat assessment scores for stations FR-1 and FR-2 on Fletcher Run and station LR-1 on reference stream Limestone Run. The predominant surrounding land use at station FR-1 on Fletcher Run was pasture/open field. The dominant substrates observed at station FR-1 for the two events were gravel (30%), bedrock (20-25%), and cobble (20%), while at station LR-1, cobble (45-50%), boulder (30%), and gravel (15%) were estimated to be the dominant substrates.

The Riffle/Run Prevalence habitat assessment scores (215 and 216) were higher (better) at LR-1 compared to FR-1 (152 and 145) for the May 2019 and March 2020 surveys, respectively (Table 6). The habitat scores for station LR-1 are within the "Optimal" category (240-192), while the station FR-1 scores are within the "Suboptimal" category (180-132), based on the habitat assessment scoring criteria provided in Appendix A, Section 3 of DEP (2003).

Sampling station FR-2 located further downstream on Fletcher Run had riffle/run and limited pool habitats. The predominant surrounding land use at FR-2 on Fletcher Run is pasture. The dominant substrates observed at FR-2 were gravel (35-40%), cobble (15-20%), and sand (15-17%). The Riffle/Run habitat assessment scores at FR-2 (121 and 126) were lower than scores obtained for FR-1 and were between the "Suboptimal" (180-132) and "Marginal" (120-72) categories.

Several habitat parameters received sub-optimal scores at both FR-1 and FR-2, but FR-2 had more parameters scored as marginal, including instream cover and epifaunal substrate. The riparian vegetative zone habitat parameter received poor scores at station FR-2. Overall, the Fletcher Run sampling stations received lower scores for most individual habitat parameters

(mostly suboptimal to marginal) compared to the EV reference stream, where most habitat parameters were scored as optimal.

## 5.3 BENTHIC MACROINVERTEBRATE DATA ANALYSIS

### 5.3.1 Fletcher Run

#### *5.3.1.1 Fletcher Run – Benthic Community Taxonomic Composition*

Table 7 presents the results for the analysis of the benthic macroinvertebrate subsamples for stations FR-1 and FR-2 on Fletcher Run and station LR-1 on the reference stream for CEC's May 2019 and March 2020 sampling events. These data are presented primarily at the genus level of taxonomic identification. The number of organisms for each distinct taxon is presented for these six samples. Table 7 also provides taxonomic results for the Department sample collected at Fletcher Run upstream in March 2009. As previously noted, CEC established station FR-1 on Fletcher Run near this Department station.

The Department subsample from March 2009 (upstream station) contained more total taxa (20 taxa) than the CEC FR-1 subsample from May 2019 (17 taxa), but fewer taxa than the FR-1 March 2020 subsample (26 taxa). This same trend was observed when the CEC FR-2 subsamples were compared to the Department's upstream sample.

The benthic macroinvertebrate samples collected by CEC from Fletcher Run contained a low percentage of pollution intolerant mayflies (range 0 to 1.9%), compared to Limestone Run (41.7 to 45.0%). Modified EPT Taxa numbers were also lower (range 3 to 9 taxa) compared to Limestone Run (16 to 20 taxa). Family Chironomidae (midge fly larvae) was the dominant taxon in all CEC and Department subsamples accounting for 41.6 to 59.7% of the total organisms. The pollution-intolerant mayfly *Epeorus* was the dominant taxon in the two Limestone Run subsamples from May 2019 and March 2020.

*5.3.1.2 Fletcher Run – Freestone Riffle-Run IBI*

The calculations for the six metrics that comprise the benthic IBI are shown on Table 8, and a total IBI score is shown for each Fletcher Run sample collected by the Department and CEC. The Department's IBI score for the March 2009 sample from the upstream Fletcher Run station was 37.9. CEC's May 2019 and March 2020 IBI scores for station FR-1 were 35.2 and 51.0, respectively. CEC's May 2019 and March 2020 IBI scores for downstream station FR-2 were 31.4 and 39.8, respectively. All of the Department and CEC IBI scores are less than 63.0, indicating they are considered impaired for the HQ designation.

*5.3.1.3 Fletcher Run –Antidegradation Analysis*

Table 9 (top) presents the values calculated for the five benthic antidegradation metrics for the May 2019 samples collected at candidate stations (FR-1 and FR-2) on Fletcher Run and reference station LR-1 on Limestone Run. The reference station metric values were all better than the corresponding Fletcher Run station values. The middle and lower sections of Table 9 present the Biological Condition Scores calculated for the five metrics derived from the individual comparisons of metric values for Fletcher Run stations FR-1 and FR-2 to the metric values calculated for station LR-1 for May 2019. The sums of the Biological Condition Scores for each Fletcher Run station are used to calculate the percentage comparison to the reference stream station. The percentage comparisons for Fletcher Run stations FR-1 and FR-2 to station LR-1 were 5% and 0%, respectively (Table 9).

Table 10 (top) presents the values calculated for the five benthic antidegradation metrics for the March 2020 samples collected from candidate stations (FR-1 and FR-2) on Fletcher Run and reference station LR-1 on Limestone Run. Performing a comparable analysis for this March 2020 data set resulted in percentage comparisons for Fletcher Run stations FR-1 and FR-2 to station LR-1 of 25% and 8%, respectively.

These percentages (range 0% to 25%) for the two sampling events are well below the minimum 83% required for the High Quality (HQ) stream classification category for cold water streams (DEP 2003).

## 6.0 CONCLUSIONS

The initial designation of South Fork Tenmile Creek was not based on empirical data, and there is an apparent lack of subsequent anti-degradation benthic macroinvertebrate surveys performed, using Department (2003) guidelines, to support this HQ-WWF designation for South Fork Tenmile Creek.

CEC performed biological and chemical (water quality) studies to determine if the data would support a change in the designated use of Fletcher Run from High-Quality Warm Water Fishes (HQ-WWF) to Warm Water Fishes (WWF). CEC presents the following conclusions based on the data obtained from these studies.

Fletcher Run did not meet the water chemistry conditions for a High-Quality Water (water quality measurements better than criteria in PA Code Title 25 §93.7 at least 99% of the time) based on results for total aluminum. All other water chemistry parameters identified in §93.7 met the requirements.

The benthic macroinvertebrate surveys conducted in May 2019 and March 2020 did not indicate that Fletcher Run sampling stations supported a high-quality aquatic community. The percent comparisons for Fletcher Run station FR-1 to station LR-1 (Limestone Run) for the May 2019 and March 2020 surveys were 5% and 25%, respectively. The percent comparisons for station FR-2 to station LR-1 for the two surveys were 0% and 8%, respectively. In all cases, the results were well below the 83-92% range required for the High-Quality (HQ) stream classification category based on CWF metrics.

Additionally, the lower habitat parameter scores (Suboptimal and Marginal) obtained for Fletcher Run sampling stations suggest that the habitat characteristics (condition of banks, bank vegetative protection, grazing and other disruptive pressure, and riparian zone width) at stations FR-1 and FR-2 are not representative of a HQ-WWF stream.

This study abided by the sampling and analytical methods prescribed by the Department to determine if a surface water body meets the criteria of a High-Quality stream. Furthermore, this petition contains the requisite components outlined in §23.1 for submission of a complete stream redesignation petition. The findings show that Fletcher Run is not supporting the physical, chemical, or biological characteristics of a High-Quality stream. CPCC respectfully requests that the EQB review the information contained in this report and change the Chapter 93 designation of Fletcher Run from High-Quality Warm Water Fishes (HQ-WWF) to Warm Water Fishes (WWF).

## 7.0 REFERENCES


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# FIGURES

P:\310-000\316-580\-GIS\Maps\EC02_Fletcher\316580_EC02_FIG1_USGS_MAP.mxd 11/8/2021 9:43 AM (ccyprych)

NORTH

WATERSHED AND VICINITY MAP

Ohio
Washington
Fayet
South Fork Tenmile Creek Watershed
Greene
Wetzel
Monongalia

Trib 32748 To Enlow Fork
Trib 32749 Of Enlow Fork
Trib 32704 To Owens Run
Trib 32706 Of Owens Run
Trib 32705 To Owens Run
Trib 32761 Of Enlow Fork
Trib 32762 Of Enlow Fork
Alternate FR-1
Water Sampling Location
FR-1
PADEP - March 2009
FR-2
Fletcher Run (40702)
Owens Run
Grinnage Run (40700)
Grays Fork (40689)
Trib 40699 To Grays Fork
Trib 32528 To Crabapple Creek
Crabapple Creek
Zimmerman Hollow
Trib 40698 To Grays Fork
Kent Run
Zollars Cem
Braddock Cem
Compressor Sta
Graysville
Gas Wells

SCALE IN FEET
0 1,500 3,000

**LEGEND**

- CEC BIOSTATION
- DEP BIOSTATION
- ALTERNATE WATER SAMPLING LOCATION
- DEP STREAM

**REFERENCE**

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE ACCESSED 6/23/2023.


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CONSOL PENNSYLVANIA COAL COMPANY LLC
FLETCHER RUN REDESIGNATION PROJECT
GREENE AND FAYETTE COUNTIES, PA

FLETCHER RUN SITE LOCATION MAP

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRAWN BY: | CLC | CHECKED BY: | MFD | APPROVED BY: * Hand signature on file | MLS | FIGURE NO: | 1 |
| DATE: | 6/23/2023 | SCALE: | 1 " = 1,500 ' | PROJECT NO: | 330-997 | | |

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NORTH

PADEP - April 2015

LR-1

Trib 38186 To Irishtown Run

Irishtown Run

Tucker Run

Trib 38192 To Tucker Run

Trib 38173 To Ferguson Run

Dunbar Creek (38164)

Trib 38193 To Tucker Run

Trib 38195 To Tucker Run

Trib 38198 To Tucker Run

Trib 38196 To Tucker Run

Limestone Run (38199)

Trib 38200 To Limestone Run

Trib 38202 Of Limestone Run

Trib 38204 To Limestone Run

Trib 38203 Of Limestone Run

Trib 38201 To Limestone Run

Zebley Flats

STATE GAME LANDS NO 51

Glade Run

Trib 38206 To Glade Run

Rock Run

Trib 38214 Of Glade Run

Trib 38213 Of Glade Run

Trib 38212 To Glade Run

Trib 38451 To Jonathan Run

Morgan Run

RIDGE

CHESTNUT

Gas Well

Strip Mine

Full Gospel

PIPELINE

TRAIL

JEEP

Cem

BM 2261

BM 2227

BM 1492

## WATERSHED AND VICINITY MAP

Westmoreland

Washington

Fayette

Greene

Somerset

Mayfield

Scottdale

California

Connellsville

Oliver

Uniontown

Hopwood

Masontown

Fairchance

Middle Youghiogheny River Watershed

SCALE IN FEET

0 1,500 3,000

**LEGEND**

- CEC BIOSTATION
- DEP BIOSTATION
- DEP STREAM

**REFERENCE**

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE ACCESSED 6/23/2023.


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GREENE AND FAYETTE COUNTIES, PA

LIMESTONE RUN SITE LOCATION MAP

| | | | | | | | |
|---|---|---|---|---|---|---|---|
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| DATE: | 6/23/2023 | SCALE: | 1 " = 1,500 ' | PROJECT NO: | 330-997 | | |

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NORTH

Alternate FR-1
Water Sampling Location

FR-1

PADEP - March 2009

FR-2

Fletcher Run (40702)

Grays Fork (40689)

Grinnage Run (40700)

Trib 40699 To Grays Fork

Trib 40698 To Grays Fork

Zimmerman Hollow (40701)

SCALE IN FEET
0 1,000 2,000

**LEGEND**

- CEC BIOSTATION
- DEP BIOSTATION
- DEP STREAM
- FLETCHER RUN WATERSHED BOUNDARY
- GRAYS FORK WATERSHED BOUNDARY

**REFERENCE**

ESRI WORLD IMAGERY / ARCGIS MAP SERVICE
ACCESSED 6/23/2023, IMAGERY DATE: 2021.


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# FLETCHER RUN AERIAL MAP

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|---|---|---|---|---|---|---|---|
| DRAWN BY: | CLC | CHECKED BY: | MFD | APPROVED BY: * Hand signature on file | MLS | FIGURE NO: | 3 |
| DATE: | 6/22/2023 | SCALE: | 1 " = 1,000 ' | PROJECT NO: | 330-997 | | |

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NORTH

Trib 38192 To Tucker Run

Trib 38194 To Tuc

Dunbar Creek (38164)

Trib 38193 To Tucker Run

Trib 38195 To Tucker Run

PADEP - March 2015

LR-1

Dunbar Creek (38164)

Limestone Run (38199)

Trib 38200 To Limestone Run

Trib 38204 To Limestone Run

Trib 38202 Of Limestone Run

Trib 38203 Of Limestone Run

Trib 38201 To Limestone Run

Glade Run

Trib 38205 To Glade Run

SCALE IN FEET

0 1,000 2,000

**LEGEND**

- CEC BIOSTATION
- DEP BIOSTATION
- DEP STREAM

**REFERENCE**

USGS TOPOGRAPHIC MAP/ ARCGIS MAP SERVICE ACCESSED 6/23/2023.


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LIMESTONE RUN AERIAL MAP

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|---|---|---|---|---|---|---|---|
| DRAWN BY: | CLC | CHECKED BY: | MFD | APPROVED BY: * Hand signature on file | MLS | FIGURE NO: | 4 |
| DATE: | 6/21/2023 | SCALE: | 1 " = 1,000 ' | PROJECT NO: | 330-997 | | |

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NORTH

Fletcher Run (40702)

Grimage Run (40700)

Grays Fork (40689)

**LEGEND**

- WATERSHED BOUNDARY
- DEP STREAM
- CROP/PASTURE/ORCHARDS/GROVES
- MIXED RANGELAND
- MIXED FOREST
- RESERVOIRS/PONDS
- INDUSTRIAL
- OTHER URBAN BUILT-UP
- RESIDENTIAL
- TRANSPORTATION, COMMUNICATION, AND UTILITIES
- EXTRACTION

SCALE IN FEET
0 750 1,500

**REFERENCE**

ESRI WORLD IMAGERY / ARCGIS MAP SERVICE
ACCESSED 6/23/2023, IMAGERY DATE: 2021.

SOUTHWESTERN PENNSYLVANIA COMMISSION
LAND USE/LAND COVER DATASET, 2010.
PUBLICATION DATE: 2015.

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# FLETCHER RUN LAND USE MAP

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|---|---|---|---|---|---|---|---|
| DRAWN BY: | CLC | CHECKED BY: | MFD | APPROVED BY: * Hand signature on file | MLS | FIGURE NO: | 5 |
| DATE: | 6/21/2023 | SCALE: | 1 " = 750 ' | PROJECT NO: | 330-997 | | |

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NORTH

Trib 38192 To Tucker Run
Trib 38194 To Tucker Run
Trib 38197 To Tucker Run
Trib 38193 To Tucker Run
Trib 38195 To Tucker Run
Tucker Run
Trib 38198 To Tucker Run
Dunbar Creek (38164)
Dunbar Creek (38164)
Trib 38200 To Limestone Run
Limestone Run (38199)
Trib 38202 Of Limestone Run
Trib 38204 To Limestone Run
Trib 38203 Of Limestone Run
Trib 38201 To Limestone Run
Morgan Run
Trib 38206 To Glade Run
Trib 38214 Of Glade Run
Trib 38213 Of Glade Run

**LEGEND**

- WATERSHED BOUNDARY
- DEP STREAM
- CROP/PASTURE/ORCHARDS/GROVES
- MIXED RANGELAND
- MIXED FOREST
- RESERVOIRS/PONDS
- INDUSTRIAL
- COMMERCIAL AND SERVICES
- RESIDENTIAL
- TRANSPORTATION, COMMUNICATION, AND UTILITIES
- EXTRACTION

SCALE IN FEET
0 1,300 2,600

**REFERENCE**

ESRI WORLD IMAGERY / ARCGIS MAP SERVICE ACCESSED 6/23/2023, IMAGERY DATE: 2018.

SOUTHWESTERN PENNSYLVANIA COMMISSION LAND USE/LAND COVER DATASET, 2010. PUBLICATION DATE: 2015.


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GREENE AND FAYETTE COUNTIES, PA

# LIMESTONE RUN LAND USE MAP

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DRAWN BY: | CLC | CHECKED BY: | MFD | APPROVED BY: * Hand signature on file | MLS | FIGURE NO: | 6 |
| DATE: | 6/22/2023 | SCALE: | 1 " = 1,300 ' | PROJECT NO: | 330-997 | | |

# TABLES

**TABLE 1**

**Biological Sampling Station Locations**

**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**

**Consol Pennsylvania Coal Company LLC**

**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**

**CEC Project 330-997**

| Sampling Station | Sampling Station Location | Latitude / Longitude Coordinates | |
|---|---|---|---|
| FR-1 | Fletcher Run 1st-Order Upstream Station (upstream end) | 39.945641 | -80.402950 |
| FR-1 | Fletcher Run 1st-Order Upstream Station (downstream end) | 39.944938 | -80.403338 |
| Alt-FR-1 | Fletcher Run - Alternate Upstream Water Sampling Location | 39.950285 | -80.397102 |
| FR-2 | Fletcher Run 1st-Order Downstream Station (upstream end) | 39.940167 | -80.406572 |
| FR-2 | Fletcher Run 1st-Order Downstream Station (downstream end) | 39.939297 | -80.406202 |
| LR-1 | Limestone Run 1st-Order (upstream end) | 39.927504 | -79.585379 |
| LR-1 | Limestone Run 1st Order (downstream end) | 39.927949 | -79.586360 |

**TABLE 2**
**Monthly Water Chemistry Results for Station FR-1 and Alternate FR-1 on Fletcher Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Parameter | Chapter 93 Criteria | Chapter 16 Criteria | Fletcher Run Station 1 (FR-1) and Alternate FR-1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5/9/2019 | 6/26/2019 | 7/25/2019 | 8/22/2019 | 9/24/2019 | 10/24/2019 | 11/19/2019 | 12/19/2019 | 1/22/2020 | 2/20/2020 | 3/18/2020 | 4/20/2020 |
| Field Water Temperature (°C) | (per bi-monthly or monthly max) [b] | | 12.1 | 16.4 | 16.9 | 17.4 | 11.9 | 5.3 | 1.5 | 1.5 | 2.0 | 5.0 | 7.1 | 11.2 |
| Field Dissolved Oxygen (mg/L) | 5.0 mg/L [c] | | 8.8 | 8.7 | 7.2 | 7.6 | 10.8 | 12.8 | 15.0 | 15.4 | 13.4 | 11.7 | 12.7 | 11.0 |
| Field pH (Standard Units) | 6.0 - 9.0 | | 8.19 | 7.90 | 8.01 | 8.01 | 8.12 | 8.04 | 8.00 | 8.42 | 8.10 | 7.99 | 8.30 | 8.35 |
| Field Conductivity (µS/cm) | | | 518 | 453 | 683 | 802 | 724 | 506 | 474 | 339 | 397 | 367 | 328 | 530 |
| Field Specific Conductance (µS/cm @ 25°C) | | | 687 | 542 | 808 | 937 | 965 | 810 | 858 | 656 | 707 | 594 | 499 | 720 |
| Flow (cubic feet per second) | | | 0.32 | 0.31 | 0.12 | 0.01 | 0.01 | 0.02 | 0.02 | 0.26 | 0.26 | 0.48 | 1.12 | 0.59 |
| Total Dissolved Solids (mg/L) | 500 mg/L [d]; 750 mg/L [e] | | 410 | 360 | 550 | 590 | 670 | 590 | 550 | 380 | 440 | 400 | 310 | 500 |
| Total Alkalinity (mg/L $CaCO_3$) | 20 mg/L [n] | | 210 | 180 | 220 | 230 | 250 | 220 | 200 | 160 | 170 | 160 | 140 | 160 |
| Total Hardness (mg/L $CaCO_3$) [a] | | | 260 | 210 | 280 | 350 | 320 | 280 | 300 | 240 | 240 | 240 | 200 | 250 |
| Ammonia Nitrogen (mg/L) | 1.86 mg/L [f] | | 0.066 J | 0.14 | 0.10 U | 0.10 U | 0.089 J | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.21 | 0.10 U |
| Nitrate Nitrogen (mg/L) | | | 0.25 | 0.15 | 0.19 H | 0.039 J | 0.027 J | 0.071 J | 0.049 J | 0.80 | 0.59 | 0.63 | 0.25 | 0.23 H |
| Total Phosphorus (mg/L) | | | 0.10 U | 0.054 J | 0.10 U | 0.037 J | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.044 J | 0.10 U | 0.10 U |
| Fecal Coliforms (colonies/100 mL) | 200/100 mL [g]; 2,000/100 mL [h] | | 866 | 1,120 | 84 | 776 | 2,440 | 43 | 49 | 45 | 25 | <1 | 38 | 69 |
| Chloride (mg/L) | 250 mg/L [e] | | 48 | 33 | 27 | 90 | 110 | 82 | 84 | 43 | 42 | 42 | 28 | 52 |
| Total Calcium (µg/L) | | | 80,000 | 66,000 | 86,000 | 100,000 | 97,000 | 86,000 | 91,000 | 74,000 | 72,000 | 72,000 | 61,000 | 73,000 |
| Total Magnesium (µg/L) | | | 16,000 | 12,000 | 17,000 | 21,000 | 20,000 | 17,000 | 17,000 | 13,000 | 14,000 | 14,000 | 12,000 | 15,000 |
| Total Iron (µg/L) | 1,500 µg/L [d] | | 150 | 280 | 630 | 620 | 340 | 610 | 440 | 180 | 120 | 150 | 100 | 170 |
| Total Aluminum (µg/L) | | 750 µg/L [i] | 62 | 120 | 110 | 78 | 27 J, B | 19 J | 23 J | 44 | 30 | 73 | 52 | 84 |
| Dissolved Arsenic (µg/L) | | 150 µg/L [m] | 0.56 J | 0.56 J | 0.53 J | 0.66 J | 0.80 J | 0.47 J, B | 0.42 J | 0.51 J | 1.0 U | 1.0 U | 0.31 J | 1.0 U |
| Dissolved Cadmium (µg/L) | | 0.25 µg/L [k] | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Copper (µg/L) | | 9.0 µg/L [k] | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 1.9 J | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 0.78 J | 2.0 U |
| Dissolved Nickel (µg/L) | | 52.0 µg/L [k] | 0.67 J | 0.72 J | 1.0 | 1.1 | 0.70 J | 0.91 J | 0.81 J | 0.76 J | 0.47 J | 0.43 J | 1.0 U | 1.1 B |
| Dissolved Lead (µg/L) | | 2.5 µg/L [k] | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 0.16 J, B | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Zinc (µg/L) | | 120.0 µg/L [k] | 5.0 U | 5.0 U | 3.0 J,B | 3.9 J | 3.5 J | 4.6 J | 4.8 J,B | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U |
| Dissolved Selenium (µg/L) | | 4.6 µg/L [m] | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U, B | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U *, ^ |

NOTES:

**Non-Attaining Values.**

Water samples were collected at Station FR-1 on May 9 and June 26, 2019 and March 18, 2020, and at Alternate FR-1 on all other sampling dates.

Field water chemistry measurements performed in riffle habitat.

J = Estimated value (result above Method Detection Limit [MDL], but below the Reporting Limit)

H = Sample was prepped or analyzed beyond the specified holding time.

B = Compound was found in the blank and sample.

U = Non Detect at Reporting Limit shown.

* - LCS or LCSD is outside acceptance limits.

^ - ICV, CCV, ICB, CCB, ISA, ISB, CRI, CRA, DLCK, or MRL standard: Instrument related QC is outside acceptance limits.

[a] Per APHA (2017) *Standard Method 2340B;* Total Hardness (as mg $CaCO_3$ equivalents/L) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

[b] Bimonthly or monthly-specific water temperature criteria for Warmwater Fishery (WWF) streams per PA Title 25, Chapter 93 Water Quality Standards §93.7; 30.5° C is the maximum water temperature for July and August for WWF streams.

[c] Minimum concentration.

[d] Monthly average concentration.

[e] Maximum concentration.

[f] Temperature and pH-dependent criteria; 1.86 mg/L is the maximum concentration at pH = 8.00 and Temperature = 25.0° C.

[g] Maximum value May through September.

[h] Maximum value October through April.

[i] Criteria Maximum Concentration.

[k] Criteria Continuous Concentration at [Hardness] = 100 mg/L $CaCO_3$.

[m] Criteria Continuous Concentration.

[n] Alkalinity minimum 20 mg/l as CaCO3, except where natural conditions are less.

**TABLE 3**
**Monthly Water Chemistry Results for Station FR-2 on Fletcher Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Parameter | Chapter 93 Criteria | Chapter 16 Criteria | Fletcher Run Station 2 (FR-2) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5/9/2019 | 6/26/2019 | 7/25/2019 | 8/22/2019 | 9/24/2019 | 10/24/2019 | 11/19/2019 | 12/19/2019 | 1/22/2020 | 2/20/2020 | 3/18/2020 | 4/20/2020 |
| Field Water Temperature (°C) | (per bi-monthly or monthly max) [b] | | 11.7 | 17.3 | 16.5 | 19.9 | 11.8 | 4.3 | 2.0 | 0.9 | 0.6 | 3.9 | 5.6 | 9.7 |
| Field Dissolved Oxygen (mg/L) | 5.0 mg/L [c] | | 8.8 | 8.3 | 7.3 | 6.8 | 9.0 | 12.9 | 14.5 | 15.3 | 13.5 | 12.3 | 12.2 | 11.2 |
| Field pH (Standard Units) | 6.0 - 9.0 | | 8.06 | 7.96 | 7.48 | 7.86 | 7.61 | 7.27 | 7.68 | 8.55 | 7.77 | 7.74 | 8.23 | 8.27 |
| Field Conductivity (µS/cm) | | | 462 | 420 | 443 | 562 | 427 | 347 | 331 | 220 | 262 | 252 | 288 | 338 |
| Field Specific Conductance (µS/cm @ 25°C) | | | 619 | 492 | 529 | 636 | 572 | 574 | 590 | 435 | 491 | 423 | 459 | 477 |
| Flow (cubic feet per second) | | | 0.34 | 0.42 | 0.45 | 0.10 | 0.03 | 0.09 | 0.18 | 1.30 | 1.22 | 1.33 | 1.33 | 1.75 |
| Total Dissolved Solids (mg/L) | 500 mg/L [d]; 750 mg/L [e] | | 380 | 330 | 360 | 410 | 380 | 390 | 350 | 250 | 300 | 280 | 270 | 330 |
| Total Alkalinity (mg/L $CaCO_3$) | 20 mg/L [n] | | 210 | 180 | 210 | 220 | 220 | 220 | 200 | 140 | 160 | 150 | 140 | 140 |
| Total Hardness (mg/L $CaCO_3$) [a] | | | 240 | 200 | 230 | 270 | 240 | 230 | 230 | 190 | 200 | 200 | 190 | 190 |
| Ammonia Nitrogen (mg/L) | 1.86 mg/L [f] | | 0.12 | 0.10 U | 0.10 U | 0.13 | 0.16 | 0.10 [U, F1] | 0.10 U | 0.22 | 0.089 [J] | 0.10 U | 0.10 U | 0.10 U |
| Nitrate Nitrogen (mg/L) | | | 0.20 | 0.13 | 0.052 [J, H] | 0.037[J] | 0.047[J] | 0.049[J] | 0.026[J] | 0.80 | 0.61 | 0.48 | 0.29 | 0.13[H] |
| Total Phosphorus (mg/L) | | | 0.11 | 0.063[J] | 0.10 U | 0.078[J] | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.10 U | 0.048[J] | 0.10 U | 0.10 U |
| Fecal Coliforms (colonies/100 mL) | 200/100 mL [g]; 2,000/100 mL [h] | | <2,420 | 1,553 | 93 | 2,050 | 862 | 302 | 252 | 64 | 102 | 68 | 72 | 162 |
| Chloride (mg/L) | 250 mg/L [e] | | 38 | 26 | 28 | 40 | 46 | 41 | 34 | 17 | 20 | 20 | 21 | 22 |
| Total Calcium (µg/L) | | | 74,000 | 62,000 | 70,000 | 82,000 | 73,000 | 72,000 | 73,000 | 60,000 | 60,000 | 60,000 | 57,000 | 59,000 |
| Total Magnesium (µg/L) | | | 14,000 | 11,000 | 13,000 | 15,000 | 13,000 | 13,000 | 13,000 | 9,400 | 11,000 | 11,000 | 10,000 | 11,000 |
| Total Iron (µg/L) | 1,500 µg/L [d] | | 2,000 [p] | 260 | 180 | 660 | 140 | 210 | 140 | 310 | 83 | 200 | 97 | 940 |
| Total Aluminum (µg/L) | | 750 µg/L [i] | 960 [p] | 100 | 36 | 320 | 74[B] | 95 | 25[J] | 120 | 24[J] | 89 | 42 | 290 |
| Dissolved Arsenic (µg/L) | | 150 µg/L [m] | 0.80[J] | 0.70[J] | 0.73[J] | 0.92[J] | 1.0 | 0.54 [J, B] | 0.40[J] | 0.20[J] | 1.0 U | 1.0 U | 1.0 U | 0.38[J] |
| Dissolved Cadmium (µg/L) | | 0.25 µg/L [k] | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Copper (µg/L) | | 9.0 µg/L [k] | 2.0 U | 2.0 U | 2.0 U | 1.2[J] | 1.5[J] | 1.2[J] | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 2.0 U | 2.0 U |
| Dissolved Nickel (µg/L) | | 52.0 µg/L [k] | 0.72[J] | 0.69[J] | 0.61[J] | 0.77[J] | 0.49[J] | 0.59[J] | 0.47[J] | 1.0 U | 1.0 U | 0.34[J] | 1.0 U | 0.86[J, B] |
| Dissolved Lead (µg/L) | | 2.5 µg/L [k] | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 U | 1.0 [U, B] | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Zinc (µg/L) | | 120.0 µg/L [k] | 5.0 U | 5.0 U | 2.8 [J,B] | 4.0[J] | 3.9[J] | 5.7 | 4.4 [J,B] | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 U |
| Dissolved Selenium (µg/L) | | 4.6 µg/L [m] | 5.0 U | 5.0 U | 5.0 U | 5.0 U | 5.0 [U, B] | 5.0 U | 5.0 U | 1.0[J] | 5.0 U | 5.0 U | 5.0 U | 5.0 U [*, ^] |

NOTES:

**Non-Attaining Values.**

Field water chemistry measurements performed in riffle habitat.

[J] = Estimated value (result above Method Detection Limit [MDL], but below the Reporting Limit)

[H] = Sample was prepped or analyzed beyond the specified holding time.

[B] = Compound was found in the blank and sample.

[F1] = Matrix Spike and/or Matrix Spike Duplicate Recovery is outside acceptance limits

U = Non Detect at Reporting Limit shown.

* - LCS or LCSD is outside acceptance limits.

^ - ICV, CCV, ICB, CCB, ISA, ISB, CRI, CRA, DLCK, or MRL standard: Instrument related QC is outside acceptance limits.

[a] Per APHA (2017) *Standard Method 2340B;* Total Hardness (as mg $CaCO_3$ equivalents/L) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

[b] Bimonthly or monthly-specific water temperature criteria for Warmwater Fishery (WWF) streams per PA Title 25, Chapter 93 Water Quality Standards §93.7; 30.5° C is the maximum water temperature for July and August for WWF streams.

[c] Minimum concentration.

[d] Monthly average concentration.

[e] Maximum concentration.

[f] Temperature and pH-dependent criteria; 1.86 mg/L is the maximum concentration at pH = 8.00 and Temperature = 25.0° C.

[g] Maximum value May through September.

[h] Maximum value October through April.

[i] Criteria Maximum Concentration.

[k] Criteria Continuous Concentration at [Hardness] = 100 mg/L $CaCO_3$.

[m] Criteria Continuous Concentration.

[n] Alkalinity minimum 20 mg/l as CaCO3, except where natural conditions are less.

[p] Concentrations for these total metals were elevated compared to upstream Fletcher Run (FR-1) sample

**TABLE 4**
**Water Quality Analysis for Stations FR-1 and FR-2 on Fletcher Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Parameter | Chapter 93 Criteria | Chapter 16 Criteria[f] | Chapter 16 Criteria[g] | Number of Samples | Mean | Standard Deviation | Coefficent of Variation | AFC Multiplier | CFC Multiplier | 99 Percentile Concentration AFC | 99 Percentile Concentration CFC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Hardness (mg/L $CaCO_3$) [a] | | | | 24 | 240.8 | 42.6 | 0.2 | 0.643 | 0.797 | 374.5 | 302.2 |
| Ammonia Nitrogen (mg/L) | 1.86 mg/L [c] | | | 24 | 0.1 | 0.1 | 1.5 | 0.144 | 0.264 | 0.4 | 0.2 |
| Total Calcium (mg/L) | | | | 24 | 73.3 | 12.1 | 0.2 | 0.643 | 0.797 | 114.0 | 92.0 |
| Total Magnesium (mg/L) | | | | 24 | 13.9 | 3.0 | 0.2 | 0.643 | 0.797 | 21.5 | 17.4 |
| Total Iron (µg/L) | 1,500 µg/L [b] | | | 24 | 375.4 | 414.1 | 1.1 | 0.187 | 0.345 | NA | 1088.2 |
| Total Aluminum (µg/L) | | 750 µg/L | | 24 | 120.7 | 194.0 | 1.6 | 0.137 | 0.249 | 881.1 | NA |
| Dissolved Arsenic (µg/L) | | 340 µg/L | 150 µg/L | 24 | 0.4 | 0.3 | 0.7 | 0.281 | 0.481 | 1.6 | 0.9 |
| Dissolved Cadmium (µg/L) [h] | | 4.73 µg/L [f] | 0.45 µg/L [g] | 24 | 0.0 | 0.0 | NA | NA | NA | NA | NA |
| Dissolved Copper (µg/L) | | 30.8 µg/L [f] | 19.0 µg/L [g] | 24 | 0.3 | 0.6 | 2.1 | 0.114 | 0.195 | 2.4 | 1.4 |
| Dissolved Nickel (µg/L) | | 985.5 µg/L [f] | 109.5 µg/L [g] | 24 | 0.6 | 0.3 | 0.6 | 0.321 | 0.527 | 1.8 | 1.1 |
| Dissolved Lead (µg/L) | | 165.8 µg/L [f] | 6.5 µg/L [g] | 24 | 0.01 | 0.03 | 4.9 | 0.077 | 0.103 | 0.1 | 0.1 |
| Dissolved Zinc (µg/L) | | 246.9 µg/L [f] | 248.9 µg/L [g] | 24 | 1.7 | 2.1 | 1.3 | 0.162 | 0.300 | 10.4 | 5.6 |

NOTES:

Total Aluminum is not better than the criteria 99% of the time.

Non-detected values were treated as zeroes consistent with DEP Guidance 3800-PM-WSWM0008a Rev 4/2005.

NA = Not applicable

[a] Per APHA (2017) *Standard Method 2340B;* Total Hardness (as mg $CaCO_3$ equivalents/L) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

[b] Monthly average concentration.

[c] Temperature and pH-dependent criteria; 1.86 mg/L is the maximum concentration at pH = 8.00 and Temperature = 25.0° C.

[d] Criteria Maximum Concentration. Acute Concentration Factor (AFC) Multiplier from USEPA (1991, Table 5-1)

[e] Criteria Continuous Concentration. Chronic Concentration Factor (CFC) Multiplier from USEPA (1991, Table 5-1).

[f] Criteria Maximum Concentration at [Hardness] = 241 mg/L CaCO3.

[g] Criteria Continuous Concentration at [Hardness] = 241 mg/L $CaCO_3$.

[h] Cadmium was not detected in any sample; therefore water quality for this parameter is better than criteria 99% of the time.

**TABLE 5**
**Water Chemistry Results for Station LR-1 on Limestone Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Parameter | Chapter 93 Criteria | Chapter 16 Criteria[i] | Chapter 16 Criteria[j] | Limestone Run (LR-1) - EV Reference Stream | | |
|---|---|---|---|---|---|---|
| | | | | 3/28/2019* | 5/8/2019 | 3/16/2020 |
| Field Water Temperature (°C) | 5.6° C; 12.2° C [b] | | | 2.8 | 9.4 | 4.0 |
| Field Dissolved Oxygen (mg/L) | 5.0 mg/L [c] | | | 11.6 | 9.7 | 12.5 |
| Field pH (Standard Units) | 6.0 - 9.0 | | | 8.42 | 6.92 | 8.15 |
| Field Conductivity (µS/cm) | | | | 41 | 37 | 35 |
| Field Specific Conductance (µS/cm @ 25°C) | | | | 71 | 52 | 58 |
| Flow (cubic feet per second) | | | | 2.70 | 5.98 | 4.23 |
| Total Dissolved Solids (mg/L) | 500 mg/L [d]; 750 mg/L [e] | | | 37 | 25 | 38 |
| Total Alkalinity (mg/L $CaCO_3$) | 20 mg/L [m] | | | 7.6 | 10 | 7.7 |
| Total Hardness (mg/L $CaCO_3$) [a] | | | | 22 | 22 | 20 |
| Ammonia Nitrogen (mg/L) | 1.86 mg/L [f] | | | 0.079[J] | 0.088[J] | 0.10 U |
| Nitrate Nitrogen (mg/L) | | | | 0.31 | 0.37 | 0.39 |
| Total Phosphorus (mg/L) | | | | 0.10 U | 0.10 U | 0.10 U |
| Fecal Coliforms (colonies/100 mL) | 200/100 mL [g]; 2,000/100 mL [h] | | | <1 | 15 | 1 |
| Chloride (mg/L) | 250 mg/L [e] | | | 4.4 | 1.6 | 4.6 |
| Total Calcium (µg/L) | | | | 6,400 | 6,500 | 5,800 |
| Total Magnesium (µg/L) | | | | 1,400 | 1,400 | 1,300 |
| Total Iron (µg/L) | 1,500 µg/L [d] | | | 29[J] | 58 | 54 |
| Total Aluminum (µg/L) | | 750 µg/L | | 94 | 110 | 99 |
| Dissolved Arsenic (µg/L) | | 340 µg/L | 150 µg/L | 1.0 U | 0.18[J] | 1.0 U |
| Dissolved Cadmium (µg/L) | | 0.44 µg/L [k] | 0.083 µg/L [l] | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Copper (µg/L) | | 3.1 µg/L [k] | 2.36 µg/L [l] | 2.0 U | 2.0 U | 2.0 U |
| Dissolved Nickel (µg/L) | | 125.0 µg/L [k] | 13.9 µg/L [l] | 1.5 | 1.8 | 1.9 |
| Dissolved Lead (µg/L) | | 11.4 µg/L [k] | 0.4 µg/L [l] | 1.0 U | 1.0 U | 1.0 U |
| Dissolved Zinc (µg/L) | | 31.2 µg/L [k] | 31.5 µg/L [l] | 7.5 | 6.6 | 9.7 |
| Dissolved Selenium (µg/L) | | NA | 4.6 µg/L [j] | 5.0 U | 5.0 U | 5.0 U |

NOTES:

**All values were attaining.**

Field water chemistry measurements performed in riffle habitat.

* Water sampling not associated with concurrent water sampling event on Grinnage Run and Fletcher Run

[J] = Estimated value (result above Method Detection Limit [MDL], but below the Reporting Limit)

NA = Not Applicable

U = Non Detect at Reporting Limit shown.

[a] Per APHA (2017) *Standard Method 2340B;* Total Hardness (as mg $CaCO_3$ equivalents/L) = 2.497 [Ca, mg/L] + 4.118 [Mg, mg/L].

[b] Bimonthly or monthly specific criteria; Maximum temperature for CWF streams for March 1-31 is 5.6°C (42° F) and for May 1-15 is 12.2°C.

[c] Minimum concentration.

[d] Monthly average concentration.

[e] Maximum concentration.

[f] Temperature and pH-dependent criteria; 1.86 mg/L is the maximum concentration at pH = 8.00 and Temperature = 25.0° C.

[g] Maximum value May through September.

[h] Maximum value October through April.

[i] Criteria Maximum Concentration.

[j] Criteria Continuous Concentration.

[k] Criteria Maximum Concentration at [Hardness] = 21 mg/L $CaCO_3$.

[l] Criteria Continuous Concentration at [Hardness] = 21 mg/L $CaCO_3$.

[m] Alkalinity minimum 20 mg/l as CaCO3, except where natural conditions are less.

**TABLE 6**
**Field Water Quality Measurements and Stream Habitat Data for Fletcher Run and Limestone Run Sampling Stations - May 2019 and March 2020**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| PARAMETER | Fletcher Run Sampling Stations | | | | | | | | Limestone Run | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FR-1 (Upstream) | | | | FR-2 (Downstream) | | | | Station LR-1 | | | |
| | 5/9/2019 | | 3/18/2020 | | 5/9/2019 | | 3/18/2020 | | 5/8/2019 | | 3/16/2020 | |
| | Riffle-Run | Pool | Riffle-Run | Pool | Riffle-Run | Pool | Riffle-Run | Pool | Riffle-Run | Pool | Riffle-Run | Pool |
| Time (Water quality) | 10:30 | 10:30 | 10:55 | NA | 8:45 | 8:45 | 9:20 | NA | 10:45 | 10:45 | 10:30 | 10:30 |
| Water Temperature ($^{o}$C) | 12.1 | 12.4 | 7.1 | NA | 11.7 | 11.8 | 5.6 | NA | 9.4 | 9.6 | 4.0 | 4.0 |
| Dissolved Oxygen (mg/L) | 8.82 | 7.99 | 12.72 | NA | 8.81 | 8.38 | 12.24 | NA | 9.72 | 9.27 | 12.50 | 11.94 |
| pH (Standard Units) | 8.19 | 8.11 | 8.30 | NA | 8.06 | 8.09 | 8.23 | NA | 6.92 | 6.98 | 8.15 | 8.27 |
| Conductivity (µS/cm) | 518 | 521 | 328 | NA | 462 | 462 | 288 | NA | 37 | 37 | 35 | 35 |
| Specific Conductance (µS/cm at 25$^{o}$C) | 687 | 687 | 499 | NA | 619 | 618 | 459 | NA | 52 | 52 | 58 | 59 |
| Estimated Stream Discharge (cfs) | 0.32 | | 1.12 | | 0.34 | | 1.33 | | 5.98 | | 4.23 | |
| Estimated Stream Discharge (gpm) | 142 | | 502 | | 155 | | 599 | | 2,683 | | 1,898 | |
| Water Depth (inches) | 1 - 5 | 2 - 12 | 2 - 7 | 4 - 13 | 1 - 5 | 2 - 8 | 2 - 13 | NA | 3 - 18 | 4 - 24 | 3 - 20 | 3 - 26 |
| Stream Wetted Width (feet) | 4 - 7 | | 4 - 9 | | 3 - 6 | | 4 - 10 | | 10 -22 | | 10 - 18 | |
| **Substrate Composition (%):**[a] | | | | | | | | | | | | |
| bedrock (> 2,084 millimeters) | 25 | | 20 | | 7 | | 5 | | 0 | | 0 | |
| boulder (256 - 2,084 millimeters) | 5 | | 5 | | 3 | | 3 | | 30 | | 30 | |
| cobble (64 - 256 millimeters) | 20 | | 20 | | 15 | | 20 | | 50 | | 45 | |
| gravel (2 - 64 millimeters) | 30 | | 30 | | 35 | | 40 | | 15 | | 15 | |
| sand (0.062 - 2 millimeters) | 10 | | 15 | | 15 | | 17 | | 5 | | 5 | |
| silt (0.004- 0.062 millimeters) | 5 | | 5 | | 10 | | 5 | | 0 | | 5 | |
| clay (< 0.004 millimeters) | 5 | | 5 | | 15 | | 10 | | 0 | | 0 | |
| **PADEP Riffle-Run Habitat Parameter** | | | | | | | | | | | | |
| 1. Instream Cover (Fish) | 13 | Sub-optimal | 13 | Sub-optimal | 7 | Marginal | 8 | Marginal | 18 | Optimal | 18 | Optimal |
| 2. Epifaunal Substrate | 13 | Sub-optimal | 13 | Sub-optimal | 9 | Marginal | 9 | Marginal | 18 | Optimal | 18 | Optimal |
| 3. Embeddedness | 12 | Sub-optimal | 12 | Sub-optimal | 11 | Sub-optimal | 11 | Sub-optimal | 18 | Optimal | 17 | Optimal |
| 4. Velocity/Depth Regimes | 10 | Marginal | 10 | Marginal | 10 | Marginal | 10 | Marginal | 12 | Sub-optimal | 13 | Sub-optimal |
| 5. Channel Alteration | 19 | Optimal | 19 | Optimal | 16 | Optimal | 16 | Optimal | 20 | Optimal | 20 | Optimal |
| 6. Sediment Deposition | 14 | Sub-optimal | 15 | Sub-optimal | 12 | Sub-optimal | 14 | Sub-optimal | 18 | Optimal | 18 | Optimal |
| 7. Riffle Frequency | 13 | Sub-optimal | 15 | Sub-optimal | 13 | Sub-optimal | 15 | Sub-optimal | 19 | Optimal | 19 | Optimal |
| 8. Channel Flow Status | 15 | Sub-optimal | 17 | Optimal | 16 | Optimal | 18 | Optimal | 16 | Optimal | 18 | Optimal |
| 9. Condition of Banks | 11 | Sub-optimal | 8 | Marginal | 6 | Marginal | 6 | Marginal | 19 | Optimal | 18 | Optimal |
| 10. Bank Vegetative Protection | 12 | Sub-optimal | 8 | Marginal | 10 | Marginal | 8 | Marginal | 17 | Optimal | 17 | Optimal |
| 11. Grazing or Other Disruptive Pressure | 13 | Sub-optimal | 9 | Marginal | 8 | Marginal | 8 | Marginal | 20 | Optimal | 20 | Optimal |
| 12. Riparian Vegetative Zone | 7 | Marginal | 6 | Marginal | 3 | Poor | 3 | Poor | 20 | Optimal | 20 | Optimal |
| PADEP Habitat Assessment Score (out of a possible 240)[b] | 152 | | 145 | | 121 | | 126 | | 215 | | 216 | |
| Percent of Maximum Possible PADEP (2003) Habitat Assessment Score (Narrative Criteria)[b] | 63% - Sub-optimal | | 60% - Sub-optimal | | 50% - Between Sub-optimal and Marginal | | 53% - Between Sub-optimal and Marginal | | 90% - Optimal | | 90% - Optimal | |

[a] Substrate percentage composition within riffle-run and pool habitats visually estimated according to Wentworth (1922) Particle Size Classes.

[b] Pennsylvania Department of Environmental Protection (2003) Habitat Scoring Ranges: Optimal (240-192), Sub-optimal (180-132), Marginal (120-72), Poor (60-20). Assessment of habitat scores falling between these ranges left to best professional judgement of investigator.

**TABLE 7**
**Benthic Macroinvertebrate Results for 200 (±20%) Subsamples Collected from Fletcher Run and Limestone Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Taxon | PA Modified Tolerance Value | Fletcher Run | | | | | Limestone Run (EV Reference Stream) | |
|---|---|---|---|---|---|---|---|---|
| | | PADEP | CEC | | | | CEC | |
| | | Fletcher Run (Upstream) | FR-1 (Upstream) | | FR-2 (Downstream) | | LR-1 | |
| | | 3/9/2009 | 5/9/2019 | 3/18/2020 | 5/9/2019 | 3/18/2020 | 5/8/2019 | 3/16/2020 |
| **PLATYHELMINTHES** (flatworms) | | | | | | | | |
| **TURBELLARIA** (flatworms) | 9 | | | | | 2 | | |
| **ANNELIDA** (segmented worms) | | | | | | | | |
| **OLIGOCHAETA** (aquatic worms) | 10 | 7 | | 2 | 1 | 5 | 2 | 3 |
| **NEMATODA** (roundworms) | 9 | 1 | | | | | | |
| **ARTHROPODA** (arthropods) | | | | | | | | |
| **CRUSTACEA** (isopods, scuds, crayfish) | | | | | | | | |
| **DECAPODA** (crayfish) | | | | | | | | |
| Cambaridae | | | | | | | | 2 |
| *Cambarus* | 6 | | 1 | | | | | |
| **INSECTA** (insects) | | | | | | | | |
| **EPHEMEROPTERA** (mayflies) | | | | | | | | |
| Ameletidae (primitive minnow mayflies) | | | | | | | | |
| *Ameletus* | 0 | 1 | | | | | | |
| Baetidae (small minnow mayflies) | | | | | | | | |
| *Acentrella* | 4 | | | | | | 10 | |
| *Baetis* | 6 | | 14 | | 41 | 5 | 11 | 10 |
| *Diphetor* | 6 | | | 24 | | 10 | | 2 |
| Caenidae (small squaregill mayflies) | | | | | | | | |
| *Caenis* | 7 | | | | | 1 | | |
| Ephemerellidae (spiny crawlers) | | | | | | | | |
| *Drunella* | 1 | | | | | | 3 | |
| *Ephemerella* | 1 | | 2 | | | | 5 | 16 |
| *Eurylophella* | 4 | | 1 | 2 | | | | |
| *Serratella* | 2 | | | | | | 1 | |
| Ephemeridae (common burrowers) | | | | | | | | |
| *Ephemera* | 2 | | 1 | | | | | 1 |
| Heptageniidae (flatheaded mayflies) | | | | | | | | |
| *Cinygmula* | 1 | | | | | | 20 | 15 |
| *Epeorus* | 0 | | | | | | 41 | 50 |
| *Maccaffertium (* old *Stenonema)* | 3 | | | 1 | | | | |
| *Stenacron* | 4 | | | | | | 1 | |
| Leptophlebiidae (prong-gill mayflies) | | | | | | | | |
| *Paraleptophlebia* | 1 | | | 1 | | | 18 | 13 |
| **PLECOPTERA** (stoneflies) | | | | | | | | |
| Chloroperlidae (green stoneflies) | | | | | | | | |
| *Alloperla* | 0 | | | | | | 6 | |
| *Haploperla* | 0 | | | 2 | | | 5 | |
| *Sweltsa* | 0 | | | | | | | 1 |
| Leuctridae (rolled-winged stoneflies) | | | | | | | | |
| *Leuctra* | 0 | | | | | | 3 | 2 |
| Nemouridae (forestflies) | | | | | | | | |
| *Amphinemura* | 3 | | | 2 | 1 | 2 | 8 | 2 |
| *Prostoia* | 2 | | | | | 4 | | |
| Peltoperlidae (roachlike stoneflies) | | | | | | | | |
| *Peltoperla* | 2 | | | | | | 2 | 4 |
| Perlidae (common stoneflies) | 3 | | | | | | | |
| *Acroneuria* | 0 | | | | | | 4 | 2 |
| *Perlesta* | 4 | | | | 4 | | | |
| Perlodidae (stripetails, springflies) | 2 | 3 | | | | | | |
| *Cultus* | 2 | | | | | | | 1 |
| *Isoperla* | 2 | | 7 | 15 | 25 | 9 | 2 | 5 |
| *Yugus* | 2 | | | | | | 1 | |
| Pteronarcyidae (giant stoneflies) | | | | | | | | |
| *Pteronarcys* | 0 | | | | | | 1 | 3 |
| **TRICHOPTERA** (caddisflies) | | | | | | | | |
| Hydropsychidae (common net-spinners) | | | | | | | | |
| *Ceratopsyche* | 5 | | 1 | | | | | |
| *Cheumatopsyche* | 6 | 6 | 16 | 8 | 4 | 9 | | |
| *Diplectrona* | 0 | | | | | | 6 | 13 |
| *Hydropsyche* | 5 | 2 | 7 | 8 | 1 | 9 | | 1 |
| Hydroptilidae (micro-caddisflies) | | | | | | | | |
| *Hydroptila* | 6 | | 3 | | 1 | | | |
| Philopotamidae (fingernet caddisflies) | | | | | | | | |
| *Chimarra* | 4 | | | 3 | | 40 | | |
| *Dolophilodes* | 0 | | | | | | 5 | |
| Polycentropodidae (trumpetnet caddisflies) | | | | | | | | |
| *Polycentropus* | 6 | | | | | | | 1 |
| Rhyacophilidae (free-living caddisflies) | | | | | | | | |
| *Rhyacophila* | 1 | 4 | | 7 | | 3 | 4 | 3 |
| Thremmatidae | | | | | | | | |
| *Neophylax* | 3 | 2 | | 3 | | | | 1 |

**TABLE 7**
**Benthic Macroinvertebrate Results for 200 (±20%) Subsamples Collected from Fletcher Run and Limestone Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| Taxon | PA Modified Tolerance Value | Fletcher Run | | | | | Limestone Run (EV Reference Stream) | |
|---|---|---|---|---|---|---|---|---|
| | | PADEP | CEC | | | | CEC | |
| | | Fletcher Run (Upstream) | FR-1 (Upstream) | | FR-2 (Downstream) | | LR-1 | |
| | | 3/9/2009 | 5/9/2019 | 3/18/2020 | 5/9/2019 | 3/18/2020 | 5/8/2019 | 3/16/2020 |
| **COLEOPTERA (aquatic beetles)** | | | | | | | | |
| Elmidae (riffle beetles) | | | | | | | | |
| *Dubiraphia* | 6 | 8 | 1 | 1 | | 2 | | |
| *Optioservus* | 4 | 1 | 6 | 6 | 2 | 1 | | 1 |
| *Oulimnius* | 5 | | | | | | 10 | 17 |
| *Stenelmis* | 5 | 11 | 20 | 5 | 4 | 6 | 1 | |
| Psephenidae (water penny beetles) | | | | | | | | |
| *Ectopria* | 5 | 1 | | | | | | 1 |
| **ODONATA** (damselflies, dragonflies) | | | | | | | | |
| **ZYGOPTERA** (damselflies) | | | | | | | | |
| Calopterygidae (broad-winged damselflies) | | | | | | | | |
| *Calopteryx* | 6 | | | 1 | | | | |
| **DIPTERA** (true flies) | | | | | | | | |
| Ceratopogonidae (biting midges) | | | | | | | | |
| *Ceratopogon* | 6 | | | 2 | | | | 1 |
| *Culicoides* | 10 | | | | 1 | 2 | | |
| *Probezzia* | 6 | 12 | 15 | 11 | 5 | 3 | | 1 |
| Chironomidae (midges) | 6 | 117 | 94 | 91 | 100 | 109 | 40 | 39 |
| Empididae (dance flies) | | | | | | | | |
| *Chelifera* | 6 | | | | | | | 1 |
| *Clinocera* | 6 | | | 1 | | 3 | | |
| *Hemerodromia* | 6 | 3 | | 1 | | | | |
| Psychodidae (moth flies) | | | | | | | | |
| *Pericoma* | 4 | 2 | | | | | | |
| Simuliidae (blackflies) | | | | | | | | |
| *Prosimulium* | 2 | 12 | | 1 | | | | 6 |
| *Simulium* | 6 | | 36 | 5 | 35 | 2 | | |
| *Stegopterna* | 6 | | | 1 | | | | |
| Stratiomyidae (soldier flies) | | | | | | | | |
| *Myxosargus* | 8 | | | | | 1 | | |
| Tabanidae (deer and horse flies) | | | | | | | | |
| *Chrysops* | 7 | 1 | | | | | | |
| (Superfamily) Tipuloidea (crane flies) | | | | | | | | |
| Limoniidae | | | | | | | | |
| *Antocha* | 3 | | | 2 | | | 1 | |
| *Hexatoma* | 2 | | | | | | 9 | 5 |
| Pediciidae | | | | | | | | |
| *Dicranota* | 3 | | | | | | | 3 |
| Tipulidae | | | | | | | | |
| *Tipula* | 4 | 1 | 1 | | | | | 2 |
| **MOLLUSCA (clams, snails)** | | | | | | | | |
| **GASTROPODA** snails, limpets) | | | | | | | | |
| Physidae (pouch snails) | 8 | 1 | | | | | | |
| **BIVALVIA** (clams) | | | | | | | | |
| Sphaeriidae (fingernail clams) | 8 | | | | | 2 | | |
| **Total Number of Taxa** | | **20** | **17** | **26** | **14** | **22** | **27** | **33** |
| **Total Number of Organisms** | | **196** | **226** | **206** | **225** | **230** | **220** | **228** |
| **Percent Dominant Taxon** | | **59.7%** | **41.6%** | **44.2%** | **44.4%** | **47.4%** | **18.6%** | **21.9%** |
| **Percent Modified Mayflies**[1] | | **0.5%** | **1.8%** | **1.9%** | **0.0%** | **0.0%** | **45.0%** | **41.7%** |
| **Modified EPT Index**[1] | | **4** | **4** | **9** | **3** | **5** | **20** | **16** |

[1]Excludes EPT or mayfly taxa with PADEP Tolerance Value ≥ 5

**TABLE 8**

**Benthic Macroinvertebrate Freestone Riffle-Run IBI Metric Scores[1] for 200 (±20%) Organism Subsamples from Fletcher Run and Limestone Run**
**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**
**Consol Pennsylvania Coal Company LLC**
**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**
**CEC Project 330-997**

| | | Fletcher Run | | | | | | | | | | Limestone Run | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | PADEP | | CEC | | | | CEC | | | | CEC | | | |
| | | Fletcher Run - Upstream | | Station FR-1 (Upstream) | | | | Station FR-2 (Downstream) | | | | Station LR-1 | | | |
| | | 3/9/2009 | | 5/9/2019 | | 3/18/2020 | | 5/9/2019 | | 3/18/2020 | | 5/8/2019 | | 3/16/2020 | |
| **Biological Metric** | **Standardized Equation** | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 | Observed Value | Adjusted Standardized Metric Score, Maximum = 1.00 |
| Total Taxa Richness | Observed value/33 | 20 | 0.606 | 17 | 0.515 | 26 | 0.788 | 14 | 0.424 | 22 | 0.667 | 27 | 0.818 | 33 | 1.000 |
| EPT Taxa Richness (PTV = 0-4) | Observed value/19 | 4 | 0.211 | 4 | 0.211 | 9 | 0.474 | 3 | 0.158 | 5 | 0.263 | 20 | 1.000 | 16 | 0.842 |
| Beck's Index, version 3 | Observed value/38 | 7 | 0.184 | 4 | 0.105 | 9 | 0.237 | 1 | 0.026 | 4 | 0.105 | 39 | 1.000 | 32 | 0.842 |
| Hilsenhoff Biotic Index | ( 10-Observed value)/ (10-1.89) | 5.59 | 0.544 | 5.62 | 0.540 | 5.19 | 0.593 | 5.50 | 0.555 | 5.44 | 0.562 | 2.42 | 0.935 | 2.58 | 0.915 |
| Shannon Diversity Index | Observed value/2.86 | 1.70 | 0.594 | 1.97 | 0.689 | 2.21 | 0.773 | 1.67 | 0.584 | 2.00 | 0.699 | 2.72 | 0.951 | 2.73 | 0.955 |
| Percent Sensitive Individuals ($PTV^2$ = 0-3) | Observed value/84.5 | 11.22 | 0.133 | 4.4 | 0.052 | 16.5 | 0.195 | 11.60 | 0.137 | 7.80 | 0.092 | 65.90 | 0.780 | 64.0 | 0.757 |
| **IBI Score = Average of Adjusted Standardized Metric Scores * 100** | | | **37.9** | | **35.2** | | **51.0** | | **31.4** | | **39.8** | | **91.4** | | **88.5** |

**TABLE 9**

**Fletcher Run Macroinvertebrate Anti-degradation Metrics and Biological Condition Scoring - May 2019 Sampling Event**

**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**

**Consol Pennsylvania Coal Company LLC**

**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**

**CEC Project 330-997**

| **Station:** | **Fletcher Run FR-1 (Upstream)** | **Fletcher Run FR-2 (Downstream)** | **Limestone Run (EV Reference Stream)** |
|---|---|---|---|
| **Survey Date:** | **5/9/2019** | **5/9/2019** | **5/8/2019** |
| **METRIC:** | | | |
| Taxa Richness | 17 | 14 | 27 |
| Modified EPT Index | 4 | 3 | 20 |
| Modified Hilsenhoff Index | 5.62 | 5.50 | 2.42 |
| Percent Dominant Taxon | 41.6% | 44.4% | 18.6% |
| | Chironomidae | Chironomidae | *Epeorus* |
| Percent Modified Mayflies | 1.8% | 0.0% | 45.0% |

| **Fletcher Run FR-1 (Upstream)** | **Taxa Richness** | **Modified EPT Index** | **Modified Hilsenhoff Index** | **Percent Dominant Taxon** | **Percent Modified Mayflies** | | |
|---|---|---|---|---|---|---|---|
| Reference Value (Limestone Run) | 27 | 20 | 2.42 | 18.6% | 45.0% | | |
| Study Value (Fletcher Run FR-1) | 17 | 4 | 5.62 | 41.6% | 1.8% | | |
| Difference | 63% | 20% | 3.20 | 23.0% | 43.2% | **Sum of Scores:** | **Percent of Maximum (40):** |
| Biological Condition Score [a] | 2 | 0 | 0 | 0 | 0 | **2** | **5%** |

| **Fletcher Run FR-2 (Downstream)** | **Taxa Richness** | **Modified EPT Index** | **Modified Hilsenhoff Index** | **Percent Dominant Taxon** | **Percent Modified Mayflies** | | |
|---|---|---|---|---|---|---|---|
| Reference Value (Limestone Run) | 27 | 20 | 2.42 | 18.6% | 45.0% | | |
| Study Value (Fletcher Run FR-2) | 14 | 3 | 5.50 | 44.4% | 0.0% | | |
| Difference | 52% | 15% | 3.08 | 25.8% | 45.0% | **Sum of Scores:** | **Percent of Maximum (40):** |
| Biological Condition Score [a] | 0 | 0 | 0 | 0 | 0 | **0** | **0%** |

NOTES:

[a] Scores Obtained from Appendix A, Section 4 of PADEP 2003.

| **%Comparison of Candidate Score to Reference Score** | **Stream Classification Category** |
|---|---|
| **≥ 92%** | **Exceptional Value (EV)** |
| **83-92%** | **High Quality (HQ)** |
| **<83%** | **Existing Use or designated use (Non-HQ or EV)** |

**TABLE 10**

**Fletcher Run Macroinvertebrate Anti-degradation Metrics and Biological Condition Scoring - March 2020 Sampling Event**

**Aquatic Life Use and Antidegradation Special Protection Attainment Determination**

**Consol Pennsylvania Coal Company LLC**

**Richhill Township, Greene County and Dunbar Township, Fayette County, Pennsylvania**

**CEC Project 330-997**

| **Station:** | **Fletcher Run FR-1 (Upstream)** | **Fletcher Run FR-2 (Downstream)** | **Limestone Run (EV Reference Stream)** |
|---|---|---|---|
| **Survey Date:** | **3/18/2020** | **3/18/2020** | **3/16/2020** |
| **METRIC:** | | | |
| Taxa Richness | 26 | 22 | 33 |
| Modified EPT Index | 9 | 5 | 16 |
| Modified Hilsenhoff Index | 5.19 | 5.44 | 2.58 |
| Percent Dominant Taxon | 44.2% | 47.4% | 21.9% |
| | Chironomidae | Chironomidae | *Epeorus* |
| Percent Modified Mayflies | 1.9% | 0.0% | 41.7% |

| **Fletcher Run FR-1 (Upstream)** | **Taxa Richness** | **Modified EPT Index** | **Modified Hilsenhoff Index** | **Percent Dominant Taxon** | **Percent Modified Mayflies** | | |
|---|---|---|---|---|---|---|---|
| Reference Value (Limestone Run) | 33 | 16 | 2.58 | 21.9% | 41.7% | | |
| Study Value (Fletcher Run FR-1) | 26 | 9 | 5.19 | 44.2% | 1.9% | | |
| Difference | 78.8% | 56.3% | 2.61 | 22.3% | 39.8% | **Sum of Scores:** | **Percent of Maximum (40):** |
| Biological Condition Score [a] | 7 | 2 | 0 | 0 | 1 | **10** | **25%** |

| **Fletcher Run FR-2 (Downstream)** | **Taxa Richness** | **Modified EPT Index** | **Modified Hilsenhoff Index** | **Percent Dominant Taxon** | **Percent Modified Mayflies** | | |
|---|---|---|---|---|---|---|---|
| Reference Value (Limestone Run) | 33 | 16 | 2.58 | 21.9% | 41.7% | | |
| Study Value (Fletcher Run FR-2) | 22 | 5 | 5.44 | 47.4% | 0.0% | | |
| Difference | 66.7% | 31.3% | 2.86 | 25.5% | 41.7% | **Sum of Scores:** | **Percent of Maximum (40):** |
| Biological Condition Score [a] | 3 | 0 | 0 | 0 | 0 | **3** | **8%** |

NOTES:

[a] Scores Obtained from Appendix A, Section 4 of PADEP 2003.

| **%Comparison of Candidate Score to Reference Score** | **Stream Classification Category** |
|---|---|
| **≥ 92%** | **Exceptional Value (EV)** |
| **83-92%** | **High Quality (HQ)** |
| **<83%** | **Existing Use or designated use (Non-HQ or EV)** |

# APPENDIX A

# PHOTOGRAPHS

# PHOTOGRAPHS

## FLETCHER RUN AND LIMESTONE RUN
## BENTHIC MACROINVERTEBRATE SURVEY – MAY 8-9, 2019

**Photograph 1:** Upstream view of riffle habitat near downstream end of station FR-1 on Fletcher Run during benthic macroinvertebrate sampling event on May 9, 2019.

**Photograph 2:** Eroded right descending bank in lower section of station FR-1 (May 9, 2019)

**Photograph 3:** Upstream view of Fletcher Run approximately 100 feet above downstream end of station FR-1 (May 9, 2019).

**Photograph 4:** Upstream view of riffle habitat in upper section of station FR-1.

**Photograph 5:** Upstream view of Fletcher Run station FR-2 from downstream end of station, showing livestock in active pasture beyond right bank (May 9, 2019).

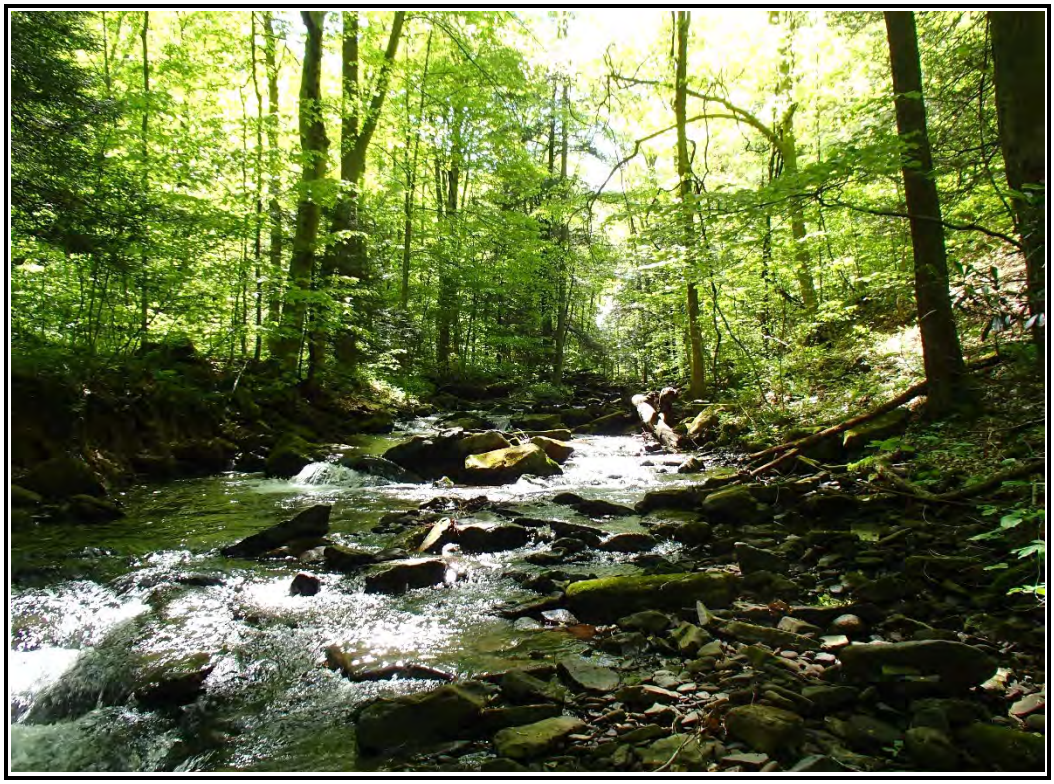
**Photograph 6:** Upstream view of riffle habitat within Fletcher Run station FR-2 (May 9, 2019)

**Photograph 7:** Upstream view of riffle habitat in upper section of station FR-2, showing right bank disturbance from livestock access (May 9, 2019).

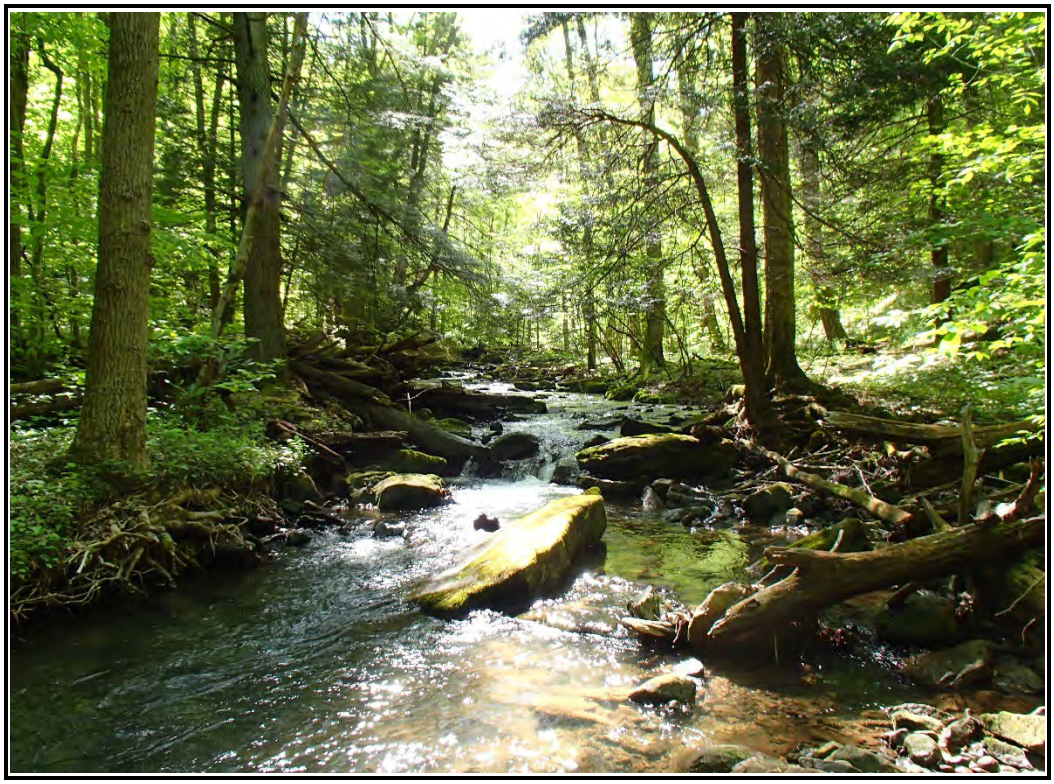
**Photograph 8:** Upstream view of shallow pool near the upstream end of station FR-2 where monthly water chemistry samples were collected (May 9, 2019).

**Photograph 9:** Upstream view from downstream end of station LR-1 on Exceptional Value (EV) stream Limestone Run in Fayette County, PA on May 8, 2019).

**Photograph 10:** Upstream view of riffle habitat within station LR-1 showing boulder, cobble, and gravel dominated substrate (May 8, 2019).



**Photograph 11:** Upstream view of riffle habitat within upper section of station LR-1 (May 8, 2019).



**Photograph 12:** Upstream view of Limestone Run from upstream end of station LR-1 (May 8, 2019).

# PHOTOGRAPHS

## FLETCHER RUN AND LIMESTONE RUN
## BENTHIC MACROINVERTEBRATE SURVEY – MARCH 16 AND 18, 2020

**Photograph 1:** Upstream view of riffle habitat near downstream end of station FR-1 on Fletcher Run during benthic macroinvertebrate sampling event on March 18, 2020.

**Photograph 2:** Eroded right descending bank in lower section of station FR-1 (March 18, 2020)

**Photograph 3:** Upstream view of Fletcher Run approximately 100 feet above downstream end of station FR-1 (March 18, 2020).

**Photograph 4:** Upstream view of mid-channel gravel bar in upper section of station FR-1. (March 18, 2020).

**Photograph 5:** Upstream view of Fletcher Run station FR-2 from downstream end of station, showing riffle habitat (March 18, 2020).

**Photograph 6:** Upstream view of riffle habitat within Fletcher Run station FR-2 at time of benthic macroinvertebrate survey on March 18, 2020.

**Photograph 7:** Upstream view of riffle habitat in upper section of station FR-2, showing right bank disturbance from livestock access (March 18, 2020).

**Photograph 8:** Upstream view near upstream end of station FR-2 (March 18, 2020).

**Photograph 9:** Upstream view from downstream end of station LR-1 on Exceptional Value (EV) stream Limestone Run in Fayette County, PA on March 16, 2020.

**Photograph 10:** Upstream view of riffle habitat within station LR-1 showing boulder, cobble, and gravel dominated substrate (March 16, 2020).

**Photograph 11:** Upstream view of riffle habitat within upper section of station LR-1 (March 16, 2020).

**Photograph 12:** Upstream view of Limestone Run from upstream end of station LR-1 (March 16, 2020).