GALLOWS RUN

BUCKS COUNTY

WATER QUALITY STANDARDS REVIEW
STREAM REDESIGNATION EVALUATION

Segment: Basin
Stream Code: 03278
Drainage List E

WATER QUALITY MONITORING SECTION (RMR)
DIVISION OF WATER QUALITY ASSESSMENT AND STANDARDS
BUREAU OF WATER STANDARDS AND FACILITY REGULATION
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MAY 2010

INTRODUCTION

The Gallows Run basin is currently designated Cold Water Fishes, Migratory Fishes (CWF, MF) in Chapter 93 and was evaluated for a redesignation to High Quality – Cold Water Fishes (HQ-CWF), MF in response to a petition submitted to the Environmental Quality Board (EQB) by the Gallows Run Watershed Association dated March 6, 2006. The petitioner requested redesignation of the Gallows Run basin alleging that the existing aquatic life use of the basin is of higher quality than is represented by the current designation. The EQB accepted the petition for further study on May 17, 2006. In anticipation of EQB acceptance, the Department conducted aquatic life use and stream survey work in the Gallows Run basin on May 08-09, 2006.

GENERAL WATERSHED DESCRIPTION

Gallows Run is a third-order tributary to the Delaware River at RMI 171.80 in northern Bucks County near Kintnersville and Ferndale, PA (Rieglesville 7.5-minute series USGS quadrangle) and drains 8.72mi^2 of land (Figure 1). It is located in Nockamixon, Durham, and Springfield Townships. Land use consists primarily of privately owned, suburban residential, forest, and old fields and horse pastures. The stream is relatively small and shallow, and is subject to substantial stormwater run-off due to urban development and limited riparian buffers. State Route 611 parallels the stream for much of its length, and is a significant contributor to stormwater runoff. According to a 2002 PA Fish and Boat (PFBC) report, 58 percent of the stream is within 109 yards of public roads.

WATER QUALITY AND USES

Surface Water

Leachate from the Hidden Valley Landfill (also known as the Nockamixon Landfill, currently inactive), located on the unnamed tributary to Gallows Run (locally known as “Nockamixon Creek”) had severely polluted the stream in the late 1960s. A leachate treatment facility began operating in 1973 and appeared to mitigate the problem until approximately 2007, when residents noticed severe iron precipitation in the stream. The subsequent investigation of discharge monitoring records from the periods December 2003 to December 2007 indicated landfill leachate had greatly exceeded effluent limitations for several parameters (including ammonia and iron) at outfall 002 (Figure 1). The only other NPDES permitted discharge to Gallows Run is from the Palisades High School sewage treatment facility in Ferndale. Camp Nockamixon operates a small water treatment facility on Gallows Run and has several ground water wells for water supply. The historic Durham mill and furnace is permitted for a septic system and ground water withdrawal. Residential waste is treated by private, on-lot septic systems.

No long-term water quality data were available from the Gallows Run basin that would allow a direct comparison to water quality criteria. Grab samples taken May 9, 2006 at four locations in the watershed revealed moderately hard water quality and modest levels of fecal coliform bacteria (Table 2). No recent precipitation events had occurred to influence spring base flow. Due to the instantaneous nature of water chemistry grab samples, the indigenous aquatic

community is a better indicator of long-term water quality conditions and is used as a measure of both water quality and ecological significance.

Habitat

Physical instream habitat conditions were evaluated at each of the five stations where benthic macroinvertebrates were sampled. The habitat evaluation consists of rating twelve habitat parameters to derive an overall station habitat score. The cumulative habitat scores for the five Gallows Run stations ranged from 134 to 190, reflecting mostly suboptimal habitat conditions (Table 3). The optimal range for cumulative habitat condition score is from 192 to 240.

Benthos

Benthic macroinvertebrate collection efforts were employed using the Department's antidegradation sampling methodology, which is a modification of EPA's Rapid Bioassessment Protocols (Plafkin, et al. 1989; Barbour et al. 1999). Benthos were collected on five stations in the Gallows Run basin and mainstem on May 8-9, 2006. Taxonomic diversity was fair, ranging from 15 to 21 taxa (Table 4), but the benthic communities at all five stations were dominated by pollution- and disturbance-tolerant diptera (e.g., Chironomidae). Pollution sensitive mayflies were markedly reduced compared to typical abundances.

The Department used Pine Creek in Berks County (Manatawny USGS Quadrangle) as a reference for comparison to Gallows Run. Pine Creek is designated in Chapter 93 as having an Exceptional Value (EV) aquatic life use. It was chosen for a comparison to the candidate stream based on its proximity and documented biological integrity.

Fish

Electrofishing conducted by the PFBC on June 8, 2002 indicated that the Gallows Run mainstem supports a sparse coldwater fish community, to include a low-biomass wild brown trout (*Salmo trutta*) population (one young-of-the-year fish collected). That survey also documented an American eel (*Anguilla rostrata*) population (13 individuals collected). Other species collected were cutlips minnow (*Exoglossum maxillingua*), blacknose dace (*Rhinichthys atratulus*), longnose dace (*Rhinichthys cataractae*), and white sucker (*Catostomus commersoni*). Gallows Run is listed under the PFBC's Wild Trout Program and is currently managed as a Class D brown trout fishery. Class D streams are those that support a brook, brown, or combined brook and brown trout biomass of less than 10 kilograms/hectare.

BIOLOGICAL USE QUALIFICATIONS

The biological use qualifying criterion applied to Gallows Run was the antidegradation integrated benthic macroinvertebrate scoring test approved by the Department described at §93.4b(a)(2)(i)(A) and §93.4b(b)(1)(v). This scoring test is based on the benthic samples referenced above. Following the Department's antidegradation protocol, a 200+/- 20% count subsample was randomly selected from the total sample and enumerated (Table 4). Five benthic macroinvertebrate metrics (taxa richness, modified EPT index (total number of intolerant Ephemeroptera, Plecoptera, and Trichoptera taxa), modified Hilsenhoff Biotic Index (HBI), percent dominant taxon, and percent modified mayflies) were used in an integrated comparison

of the stations on Gallows Run (1GR, 2GR, 3UNT, 4UNT, and 5GR) to a reference station (1PC) established in the Exceptional Value (EV) Pine Creek basin (Manatawny 7.5-minute series USGS quadrangle), Berks County. The reference station (1PC) was selected based on ecoregion, drainage area, and documented biological integrity from previous use as a reference station.

Based on the benthic macroinvertebrate scoring test described above, no stations in the Gallows Run basin (Table 5) met the antidegradation qualifying biological condition scoring comparison of 83% listed at 25 Pa. Code §93.4b (a)(2)(i)(A). No other Antidegradation qualifying requirements listed in § 93.4b apply to the Gallows Run basin.

In addition to applying the above antidegradation scoring test, the Department's benthic Index of Biotic Integrity (IBI) was also employed. The Department's IBI for benthic macroinvertebrates in wadeable freestone riffle-run streams (Chalfant, 2007; modified in 2009) is calculated as the arithmetic mean of six adjusted, standardized metric scores: Beck's index (a tolerance value-weighted richness metric based on the most sensitive taxa defined as having HBI tolerance values of 2 or less); sensitive (having HBI tolerance values of 4 or less) EPT taxa richness; total taxa richness; Shannon Diversity; Hilsenhoff Biotic Index; and percent individuals of sensitive (having HBI tolerance values of 3 or less) taxa in a 200 (+/- 20%) count sub-sample. The six raw metric scores are standardized to reference values, which results in standardized metric scores adjusted to a scale of 0 to 100. These six adjusted standardized scores are averaged to calculate the total IBI score. IBI scores closer to 100 represent reference-quality conditions and scores closer to 0 represent more impacted conditions. An aquatic life use impairment threshold has been defined as an IBI score less than 63 (for non-summer samples). All five Gallows Run stations scored 61.9 or lower. Impairment decisions pertaining to IBI scores within a range of 50 to 63 may be based on site-specific considerations, e.g., a watershed's natural hydrogeology or habitat, probable sources and causes of impairment, or other mitigating factors. Such site-specific considerations of Gallows Run sites suggest that these stations are impaired.

PUBLIC RESPONSE AND PARTICIPATION SUMMARY

The Department provided public notice of this designation evaluation and requested any technical data from the general public through publication in the Pennsylvania Bulletin on June 24, 2006 (36 Pa.B 3167). In addition, the Bucks County Planning Commission and Nockamixon, Durham, and Springfield Townships were notified of the redesignation evaluation in a letter dated June 21, 2006. The Gallows Run Watershed Association provided the Department with the Gallows Run Watershed Restoration and Protection Plan. The Bucks County Planning Commission referred the Department to the Gallows Run Watershed Restoration and Protection Plan, the Heritage Conservancy's Middle Delaware River Conservation Plan, and the Bucks County Planning Commission's Delaware River (North) Act 167 Stormwater Management Plan. No other data were received resulting from the public notice.

The petitioner and local municipality and planning commission representatives were notified by a postcard mailing that the report was available on the Department's web page for review with a 30-day comment period, which closed on April 16, 2010. No comments were received in response to this notice.

CONCLUSIONS AND RECOMMENDATIONS

Based on applicable regulatory definitions and requirements of § 93.4b, the Department recommends that the Gallows Run basin, remain designated in Chapter 93 as Cold Waters Fishes, Migratory Fishes. This recommendation is based on the presence of a cold water biological community with biological condition scores lower than 83% of the reference score, and the presence of a modest brown trout fishery and American eel population (a migratory fish). This recommendation does not reflect the HQ-CWF designation sought in the petition. Because the Hidden Valley Landfill leachate treatment system is being repaired, the Department does not recommend designating any of the five stations "impaired" at this time. Follow-up assessments should be made at a suitable after the treatment system is online and the watershed has sufficient time to naturally recover.

REFERENCES

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water; Washington, D.C.

Chalfant, B. 2007. A Benthic Index of Biotic Integrity for Wadeable Freestone Streams in Pennsylvania. Pennsylvania Department of Environmental Protection, Division of Water Quality Standards. URL: http://www.depweb.state.pa.us/watersupply/lib/watersupply/ibi_rifflerun.pdf, accessed 20 February 2009.

Gallows Run Watershed Association. 2004. Gallows Run Restoration and Protection Plan. URL: http://www.grwabucks.org/report.htm, accessed 30 October 2007.

PA Fish and Boat Commission. File information.

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross, and R.M. Hughes. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish. U.S. Environmental Protection Agency, Office of Water Regulation and Standards, Washington, D.C. EPA 440-4-89-001.

FIGURE 1
GALLOWS RUN, BUCKS COUNTY

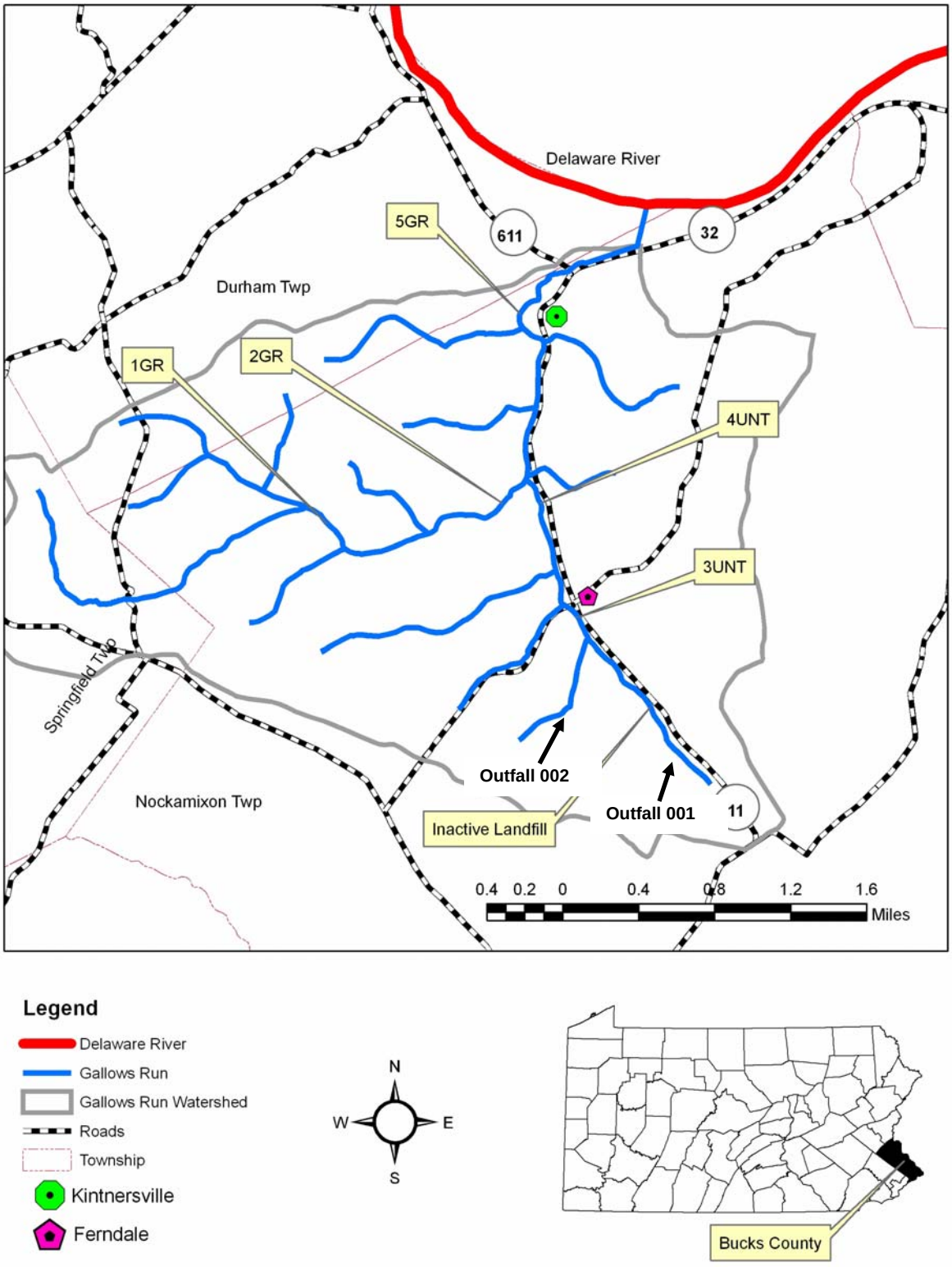

TABLE 1
STATION LOCATIONS
GALLOWS RUN, BUCKS COUNTY
MAY 09, 2006

STATION	LOCATION
1GR	Gallows Run upstream of Camp Nockamixon's upper pond outfall, Nockamixon Township. Lat: 40.5406, Long: -75.2041
2GR	Gallows Run upstream of Traugers Crossing Road bridge in Nockamixon Township. Lat: 40.5417, Long: -75.2041
3UNT	"Nockamixon Creek" approximately 100m upstream of Church Hill Road along SR611 in Nockamixon Township. Lat: 40.5328, Long: -75.1788
4UNT	"Nockamixon Creek" approximately 200m upstream of Gallows Run confluence, along SR611 in Nockamixon Township. Lat: 40.5406, Long: -75.1821
5GR	Gallows Run upstream of the Kintner Road bridge in Nockamixon Township. Lat: 40.5557, Long: -75.1836
1PC	Pine Creek approximately 200m upstream of the Heligs School Road Bridge in Pike Township, Berks County. Lat: 40.4232, Long: -75.7043

TABLE 2
WATER CHEMISTRY
GALLOWS RUN, BUCKS COUNTY
MAY 09, 2006

STATION	1GR	2GR	3UNT	4UNT	5GR
Laboratory Parameters					
pH	-	8.3	7.9	8.3	8.2
Alkalinity	-	48.2	75.6	79.2	56.4
Acidity	-	-35.4	-58.8	-64.4	-45.0
Hardness	-	69	118	134	87
T Diss. Sol.	-	140	240	264	158
Susp.Sol.	-	<2	<2	<2	<2
NH_3-N	-	0.02	0.02	0.38	<0.02
NO_2-N	-	<0.01	<0.01	0.02	<0.01
NO_3-N	-	1.93	1.56	1.73	1.45
Total P	-	0.026	0.031	0.134	0.037
Ca	-	18.2	29.6	34.8	22.7
Mg	-	5.760	10.8	11.4	7.461
Cl	-	12.0	19.8	27.2	16.2
SO_4	-	<20.0	36.2	47.9	24.3
As[2]	-	<4.0	<4.0	<4.0	<4.0
Cd[2]	-	<0.2	<0.2	<0.2	<0.2
hex Cr[2]	-	<1.0	<1.0	<1.0	<1.0
Cr[2]	-	<50.0	<50.0	<50.0	<50.0
Cu[2]	-	<4.0	15.0	<4.0	<4.0
Cu Diss[2]	-	<4.0	<4.0	<4.0	<4.0
Fe[2]	-	60.0	<20.0	101.0	<20.0
Pb[2]	-	<1.0	<1.0	<1.0	<1.0
Mn[2]	-	<10.0	<10.0	33.0	<10.0
Ni[2]	-	<4.0	<4.0	<4.0	<4.0
Zn[2]	-	<5.0	<5.0	<5.0	<5.0
Al[2]	-	13.8	<10.0	54.7	28.7
Total Coliform[3]	-	1400	900	1400	1000
Fecal Coliform[3]	-	<20	280	140	20

[1] - Except for pH & and indicated otherwise, all values are total concentrations in mg/l

[2] - Total concentrations in µg/l

[3] - Colonies per 100ml

TABLE 3
HABITAT ASSESSMENT[1]
GALLOWS RUN, BUCKS COUNTY
PINE CREEK, BERKS COUNTY (REFERENCE)
MAY 08-10, 2006

PARAMETER	Scoring Range	1GR	2GR	3UNT	4UNT	5GR	1PC
1. instream cover (fish)	0-20	16	15	15	14	13	17
2. epifaunal substrate	0-20	16	19	16	19	18	18
3. embeddedness	0-20	18	18	12	16	18	18
4. velocity/depth regimes	0-20	16	14	13	15	11	17
5. channel alterations	0-20	13	14	7	15	18	19
6. sediment deposition	0-20	18	18	15	16	18	18
7. frequency of riffles	0-20	18	18	15	19	19	18
8. channel flow status	0-20	17	14	13	12	15	17
9. condition of banks	0-20	14	16	12	12	11	17
10. bank vegetation protection	0-20	13	15	6	15	16	18
11. vegetation disruptive pressure	0-20	15	13	5	16	18	19
12. riparian vegetation zone width	0-20	12	8	5	13	15	18
Total Score	0-240	186	182	134	182	190	214
Rating		Suboptimal	Suboptimal	Suboptimal	Suboptimal	Suboptimal	Optimal

[1] - Refer to Figure 1 for station locations

TABLE 4
SEMI-QUANTITATIVE BENTHIC MACROINVERTEBRATE DATA
GALLOWS RUN, BUCKS COUNTY
PINE CREEK, BERKS COUNTY (REFERENCE)
MAY 08-10, 2006

TAXA	1GR	2GR	3UNT	4UNT	5UNT	1PC
EPHEMEROPTERA (Mayflies)						
Baetidae; *Acentrella*		2	1	5		1
Baetis	49	38	20	18	14	1
Ephemerellidae; *Drunella*						19
Ephemerella	29	17		1	8	57
Heptageniidae; *Cinygmula*						3
Epeorus	6					4
***Maccaffertium* (*Stenonema*)**	1	3		1	5	
Rhithrogena						10
Leptophlebiidae; *Paraleptophlebia*		1				2
PLECOPTERA (Stoneflies)						
Chloroperlidae			1			
Alloperla						2
Haploperla				1		
Sweltsa	2	5			1	
Leuctridae; *Leuctra*	11	7		1	2	1
Nemouridae; *Amphinemura*	33	16	7	11	8	2
Peltoperlidae; *Peltoperla*						9
Perlidae; *Acroneuria*	1			1		2
Perlesta		21			11	10
Perlodidae; *Isoperla*	6		1		1	8
Pteronarcycidae; *Pteronarcys*						2
TRICHOPTERA (Caddisflies)						
Glossosomatidae; *Agapetus*		1				10
Glossosoma		1				
Hydropsychidae; *Cheumatopsyche*		2	2	2	10	
Diplectrona						1
Hydropsyche		3	1	3	5	
Philopotamidae; *Chimarra*			4	1	1	
Dolophilodes	11	6			6	38
Wormaldia				1		
Polycentropodidae; *Cyrnellus*				2		
Polycentropus	1	6	2	6	9	
Rhyacophilidae; *Rhyacophila*	1		2		1	6
DIPTERA (True Flies)						
Blephariceridae; *Blepharicera*						1
Chironomidae	49	83	126	130	123	10
Ceratopogonidae; *Probezzia*			1			

Table 4, con't TAXA	1GR	2GR	3UNT	4UNT	5UNT	1PC
Empididae; *Hemerodromia*		1				
Simuliidae; *Simulium*			10	6	3	
Tipulidae; *Antocha*	1	1				
Dicranota						1
Hexatoma	1				2	3
COLEOPTERA (Beetles)						
Elmidae; *Oulimnius*	6					5
Optioservus					1	
Promoresia						1
Psephenidae; *Ectopria*						1
Psephenus	1	3	21	2	2	2
ODONATA (Dragonflies, Damselflies)						
Gomphidae; *Lanthus*		1			1	
MEGALOPTERA (Dobsonflies, Fishflies)						
Corydalidae; *Nigronia*						3
NON-INSECT TAXA						
Cambaridae; *Orconectes*				1		
Oligochaeta	1	6	28	8	2	
SUMMARY						
Total number of taxa	18	21	15	19	21	29
Total number of individuals	210	224	227	201	216	215

TABLE 5
RBP METRIC COMPARISON
GALLOWS RUN, BUCKS COUNTY
PINE CREEK, BERKS COUNTY (REFERENCE)
MAY 08-10, 2006

METRIC	STATIONS					REFERENCE[1]
	1GR	2GR	3UNT	4UNT	5GR	1PC
TAXA RICHNESS	18	21	15	19	21	29
Cand/Ref (%)	62	72	52	66	72	-
Biol. Cond. Score	1	5	0	2	5	8
MOD. EPT INDEX	10	11	6	9	10	19
Cand/Ref (%)	53	58	32	47	53	-
Biol. Cond. Score	1	2	0	0	1	8
MOD. HBI	3.75	4.65	6.08	5.76	5.18	1.39
Cand-Ref	2.39	3.29	4.72	4.40	3.82	-
Biol. Cond. Score	0	0	0	0	0	8
% DOMINANT TAXA	23.3	37.1	55.5	64.7	56.9	26.5
Cand-Ref	-3.2	10.6	29	38.2	30.4	-
Biol. Cond. Score	8	8	0	0	0	8
% MOD. MAYFLIES	17.1	10.3	0.44	3.48	6.02	44.7
Ref-Cand	27.6	34.4	44.26	41.22	38.68	-
Biol. Cond. Score	4	2	0	0	1	8
TOTAL BIOLOGICAL						
CONDITION SCORE	**14**	**17**	**0**	**2**	**7**	**40**
% COMPARABILITY						
TO REFERENCE	**35**	**43**	**0**	**5**	**18**	**-**
PA DEP IBI SCORE (<63 indicates impairment)	**61.9**	**57.3**	**33.7**	**42.8**	**49.6**	**96.5**

[1] - Pine Creek, Berks County