

# **Appendix B:**

## **Surface Water Parameters**

## **SURFACE WATER PARAMETERS**

### STREAM CLASSIFICATION CODE (TITLE 25, PA CODE)

EV	Exceptional value
HQ-CWF	High Quality Cold Water Fishery
CWF	Cold Water Fishery
MF	Migratory Fishes
TSF	Trout Stocking Fishery

### **Volume of Flow -**

Flow is essential in determining the dilution factor for any potential discharge. It is also an indicator of recent weather patterns. Volumes of flow would be higher than normal after a period of heavy precipitation. This is important because during a test period which may occur after heavy rains, the quality of the stream may appear degraded due to non-point source run off. It is also important that the testing period occur during a low flow since pollutants would have the most damaging effect during low flow.

### **Temperature -**

Temperature is essential in determining if acceptable standards exist for a particular stream classification. Elevated temperatures from heated water discharges may have a significant ecological effect. It is also important in determining what the direct effect on fish and other aquatic life will be as a result of temperature fluctuation. Maximum temperatures for streams during the month of August are as follows:

CWF and HQ-CWF		18.9 C (66 F)
WWF and HQ-TSF		30.6 C (87 F)
TSF and HQ-WWF	August 1-15	26.7 C (80 F)
	August 16-31	30.6 C (87 F)
EV	Must maintain Existing Quality	

### **Dissolved Oxygen -**

Oxygen dissolved in water is measured as D.O. Different levels of D.O. are necessary to support various types of aquatic life. D.O. levels in natural and wastewaters are dependent on the physical, chemical and biochemical activities prevailing in the water body.

Many fishing waters average a D.O. of 9.0 mg/l and above. The minimum daily averages for D.O. are as follows:

CWF	5.0 mg/l
WWF and TSF	4.0 mg/l

- pH -** Measurement of pH is one of the most important and frequently used tests in water chemistry. The pH value of most natural waters falls within the range of 4 to 9. The pH scale ranges from 0 (acid) to 14 (base). The majority of waters are slightly basic because of the presence of carbonates and bicarbonates. A departure from the normal pH for a particular body of water can be caused by the influx of acid or alkaline industrial wastes (acid deposition in the form of rain or snow). It is a common practice for water treatment plants to adjust the pH. The pH of a solution refers to its hydrogen ion activity. Most fish can tolerate pH values from 5.0 to 9.0, however the best fishing waters fall within the range 6.5 to 8.2.
- Specific Conductance -** Conductivity is a numerical expression of an aqueous ability to carry an electrical current. It is an indication of the dissolved inorganic solids in the water. The higher the specific conductance, the more impurities are in the water. Freshly distilled water has a conductivity of 0.5 to 2.0 micromhos/cm. The conductivity of the drinking water in the U.S. generally ranges from 50 to 1,500 micromhos/cm.
- Total Hardness -** Hardness is defined as the total amount of calcium and magnesium salts that are present in the water. Water can be defined by its total hardness as follows:
- |                       |                 |
|-----------------------|-----------------|
| Soft Water            | 0 - 60 mg/l     |
| Moderately Hard Water | 60 - 120 mg/l   |
| Hard Water            | 120 - 180 mg/l  |
| Very Hard Water       | 180 mg/l and up |
- Total Alkalinity -** Alkalinity measures the water's ability to buffer acid. It indicates the water's ability to protect fish and other aquatic life against sudden changes in pH. The best fishing waters are those with alkalinity of 100 - 120 mg/l. The minimum level of total alkalinity for aquatic life is 20 mg/l except where natural conditions are less.
- Nitrogen -** Nitrate plus nitrite as nitrogen. The maximum recommended level of nitrate plus nitrite for water supply is 10 mg/l as Nitrogen.
- Nitrate (NO<sub>3</sub>) -** Nitrate is found only in small amounts in domestic wastewater and is a major ingredient in farm fertilizer. During precipitation, varying amounts of this chemical wash from farmland into nearby waterways. Nitrates stimulate the growth of plankton on water weeds which provide food for fish. This may cause an increase in the fish population, however, if algae grows too quickly, oxygen levels in the water will be reduced and the fish may die.
- Nitrite (NO<sub>2</sub>) -** Nitrite is the intermediate stage between nitrate and ammonia. It is relatively short-lived because it is quickly converted to nitrates by bacteria. However, nitrites produce a serious illness in fish even though they don't exist for very long in the environment. Nitrite concentrations in drinking water seldom exceed 0.1 mg/l. It can be expected that levels below 0.2 mg/l are representative of normal conditions.

- Ammonia (NH<sub>3</sub>) -** Ammonia is naturally present in surface and ground water and in wastewater. Pure ammonia is strong smelling and colorless. It is manufactured synthetically from nitrogen and hydrogen or it is produced from coal gas. In nature ammonia is formed by the action of bacteria on proteins and urea. Ammonia concentrations of 0.06 mg/l can cause gill damage in fish; 0.1 mg/l may indicate domestic or agricultural wastes and 0.2 mg/l and above is lethal to trout.
- Total Phosphorous -** Phosphorous occurs in natural waters and waste waters almost solely in the form of phosphate. Phosphates enter waterways from human and animal wastes, phosphate rich rocks, waste from laundries, cleaning and industrial processes and from fertilizer.
- Phosphorous is essential to the growth of organisms and it can be the nutrient that limits the productivity of a body of water. If phosphates are present in high concentrations in streams the algae and water weeds grow more rapidly, choking the waterways and using up large amounts of oxygen. The recommended maximum level is 0.1 mg/l for rivers and streams.
- Chlorides -** Chlorides are salts that contain chlorine and metal. Common chlorides are sodium chloride, calcium chloride and magnesium chloride. Most good fishing waters have a chloride concentration of less than 170 mg/l. The recommended maximum chloride levels are 150 mg/l for special protection waters and 250 mg/l for water supply.
- Total Acidity -** Acidity can be defined as a solution's ability to neutralize bases. Acidity of water is significant because acids contribute to corrosiveness and influence certain biological processes. Measuring acidity can also reflect changes in the quality of the source water.
- Solids -** The term solids or residue refers to the matter suspended or dissolved in water. Residue may affect water and effluent quality in many different ways. It can affect the palatability of drinking water or the aesthetic quality of bathing waters. For these reasons wastewater treatment processes remove solids from the discharge.
- T.D.S. -** Total dissolved solids (T.D.S.), also termed total filterable residue refers to the portion of residue that passes through a filter of a particular size. The maximum recommended value for T.D.S. is 750 mg/l.
- T.S.S. -** Total suspended solids (T.S.S.), also termed total non-filterable residue refers to the portion of residue that cannot pass through a filter of a particular size.
- Fecal Coliform -** Coliform bacteria are common in the intestines of both warm and cold-blooded animals and aid in the digestion of food. Some of these coliform bacteria pass out of the body with the stool. Fecal coliform counts of 200/100 mls or less are desirable.

**B.O.D. -**

Biochemical oxygen demand is a parameter measured in the laboratory to determine relative oxygen requirements of wastewaters, effluents and potentially polluted waters. It gives an indication of the amount of biodegradable waste in a water sample.

If water contains a large amount of biodegradable waste, it probably contains numerous bacteria, which utilize oxygen resulting in low D.O. levels. B.O.D. levels indicate the following:

1.0 - 2.0 mg/l	Very clean water
3.0 - 5.0 mg/l	Moderately clean water
5.0 + mg/l	Potential pollution problem

This year, sampling for heavy metals was included at one site. The effects of metals in water and wastewater range from beneficial through troublesome to dangerously toxic. Some metals are essential to plant and animal growth while others may adversely affect water consumers, wastewater treatment systems, and receiving waters. The benefit versus toxicity of some metals depends on their concentrations in waters.

This sampling was added as part of the Pocono Creek Project in response to a lack of data for heavy metals in the Pocono Creek Watershed. The heavy metals descriptions were obtained from the EPA Office of Water web site. The contaminant levels indicated are from the safe drinking water toxicity lists. The following are the parameters which were tested:

**Arsenic, Dissolved -**

Arsenic is an element that occurs naturally in rocks and soil, water, air, plants, and animals. Volcanic activity, the erosion of rocks and minerals, and forest fires are natural sources that can release arsenic into the environment. Although about 90 percent of the arsenic used by industry in the United States is currently used for wood preservative purposes, arsenic is also used in paints, drugs, dyes, soaps, metals and semi-conductors. Agricultural applications, mining, and smelting also contribute to arsenic releases.

Arsenic is nonessential for plants but is an essential trace element in several animal species. Studies have linked long-term exposure to arsenic in drinking water to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver, and prostate. Non-cancer effects of ingesting arsenic include cardiovascular, pulmonary, immunological, neurological, and endocrine (e.g., diabetes) effects. Short-term exposure to high doses of arsenic can cause other adverse health effects, but such effects are unlikely to occur from U.S. public water supplies that are in compliance with the existing arsenic standard of 50 ppb.

Maximum Contaminant Level (MCL) .01 mg/l (proposed for 2001)  
Maximum Contaminant Level Goal (MCLG) of zero for arsenic in drinking water.

**Cadmium, Dissolved -**

Cadmium occurs naturally in zinc, lead and copper ores, in coal and other fossil fuels, shales and is released during volcanic action. These deposits can serve as sources to ground and surface waters, especially in contact with soft, acidic waters. Major industrial releases of cadmium are due to waste streams and leaching of landfills, and from a variety of operations that involve cadmium or zinc.

Cadmium is nonessential for plants and animals. It is extremely toxic and accumulates in the kidneys and liver. Cadmium has the potential to cause kidney, liver, bone and blood damage from long-term exposure at levels above the MCL.

MCL: 0.005 mg/l

MCLG: 0.005 mg/l

**Copper, Dissolved -**

Although Copper rarely occurs in source water, the following natural sources have been identified. Copper is widely distributed in nature in the elemental state, in sulfides, arsenites, chlorides, and carbonates. In the sedimentary cycle, copper is concentrated in the clay mineral fractions (sandstones contain 10-40 ppm, shales 30-150 ppm, and marine black shales 20-300 ppm) with a slight enrichment in those clays rich in organic material. Smelting operations and municipal incineration may also produce copper.

Copper is considered an essential trace element for plants and animals. At high doses however it has been shown to cause stomach and intestinal distress, liver and kidney damage, and anemia.

Action Level: 1.3 mg/l

MCLG: 1.3 mg/l

**Iron -**

MCL: 0.3 mg/l as dissolved iron.

**Lead, Dissolved -**

Lead may enter the environment during its mining, ore processing, smelting, refining use, recycling or disposal. It enters water from atmospheric fallout, runoff or wastewater; little is transferred from natural ores.

Lead is nonessential for plants and animals. It is toxic by ingestion and is a cumulative poison which can cause a variety of adverse health effects in humans. At relatively low levels of exposure, these effects may include interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children, slight deficits in the attention span, hearing, and learning abilities of children, and slight increases in the blood pressure of some adults. It appears that some of these effects, particularly changes in the levels of certain blood enzymes and in aspects of children's neurobehavioral development, may occur at blood lead levels so low as to be essentially without a threshold. Chronic exposure to lead has been linked to cerebrovascular and kidney disease in humans.

Action Level: > 0.015 mg/l in more than 10 percent of tap water samples

MCLG: zero

**Nickel, Dissolved -**

Nickel is found in many ores as sulfides, arsenides, antimonides & oxides or silicates; chief sources include chalcopyrite; others are pyrrhotite, pentlandite, garnierite, niccolite, millerite. The principal natural form of nickel oxide occurs in admixture with nickel sulfides in varying proportions in weathered ore. Nickel carbonate, found as the mineral zaraitite, is a potential atmospheric and surface water pollutant.

From 1987 to 1993, according to the Toxics Release Inventory nickel releases to land and water totaled nearly 27 million lbs., of which most was to land. These releases were primarily from nickel smelting/refining and steelworks industries. The largest releases occurred in Oregon and Arkansas. The largest direct releases to water occurred in Maryland and Georgia.

MCL: 0.1 mg/l

MCLG: 0.1 mg/l

**Zinc, Dissolved -**

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass and bronze.

Zinc is an essential growth element for plants and animals. Too little zinc can cause health problems, but at elevated levels it is can also be harmful. At high doses it can cause anemia and pancreas damage.

MCL: 5 mg/l

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	PARACR03	BUTZRU01	CRCRPA01	DEHOCR04
Date	8/7/06	8/7/06	8/7/06	8/7/06
Time	0830	0915	1000	1030
Stream Name	Paradise Creek	Butz Run	Cranberry Creek	Devils Hole Creek
Weather	Overcast	Sun	Overcast	Sun
Volume of Flow (cfs)	38.32	0.22	3.25	8.50
Stream Temperature (°C)	20.7	18.3	20.1	16.9
Dissolved Oxygen	9.69	8.73	8.35	9.13
pH	Field / Lab 7.5 7.09	Field / Lab 7.8 7.07	Field / Lab 7.7 6.82	Field / Lab 7.7 6.72
Conductivity µs/cm	243.0	191.3	155.8	87.7
Total Hardness	30.0	33.0	26.0	16.0
Total Alkalinity	16.5	21.0	12.5	7.00
Nitrate+Nitrite as N	0.207	0.289	0.129	0.309
Nitrate NO <sub>3</sub>	0.207	0.289	0.129	ND
Nitrite NO <sub>2</sub>	ND	ND	ND	ND
Ammonia NH <sub>3</sub>	ND	ND	ND	ND
Total Phosphorus	ND	ND	ND	ND
Chlorides	26.9	14.2	12.9	6.56
Total Acidity	6.00	3.50	3.50	4.00
T.D.S.	121	95.8	78.8	43.9
T.S.S.	ND	ND	ND	ND
Fecal Coliform	30 EST.	<10 EST.	50 EST.	60 EST.

ND - None Detected

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	PARACR04	INDIRU01	FOHIRU01	SWIFCR06
Date	8/7/06	8/7/06	8/8/06	8/8/06
Time	1115	1145	0830	0845
Stream Name	Paradise Creek	Indian Run	Forest Hills Run	Swiftwater Creek
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	2.51	0.96	3.04	16.18
Stream Temperature (°C)	17.2	10.1	20.7	21.2
Dissolved Oxygen	10.19	10.24	8.66	7.73
pH	Field / Lab 7.4 6.73	Field / Lab 5.6 ---	Field / Lab 7.4 7.19	Field / Lab 7.5 7.28
Conductivity $\mu\text{s}/\text{cm}$	328	370	380	325
Total Hardness	39.0	---	50.0	32.0
Total Alkalinity	9.00	---	28.0	21.0
Nitrate+Nitrite as N	0.542	---	0.457	0.158
Nitrate NO <sub>3</sub>	0.5420	---	0.457	0.158
Nitrite NO <sub>2</sub>	ND	---	ND	ND
Ammonia NH <sub>3</sub>	ND	---	ND	ND
Total Phosphorus	ND	---	ND	ND
Chlorides	45.7	---	41.1	39.9
Total Acidity	4.00	---	3.00	3.50
T.D.S.	166	186	191	165
T.S.S.	ND	---	ND	2.80
Fecal Coliform	<10 EST.	---	30 EST.	<10 EST.

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	SWIFCR02	PARACR01	FOHIRU09	FOHIRU06
Date	8/8/06	8/8/06	8/8/06	8/8/06
Time	0915	0945	1030	1100
Stream Name	Swiftwater Creek	Paradise Creek	Forest Hills Run	Forest Hills Run
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	19.13	19.61	4.27	1.95
Stream Temperature (°C)	21.2	20.1	22.5	17.8
Dissolved Oxygen	7.88	8.18	7.77	9.75
pH	Field / Lab 7.5 7.27	Field / Lab 7.5 7.32	Field / Lab 7.4 7.32	Field / Lab 7.5 7.40
Conductivity $\mu\text{s}/\text{cm}$	340.0	183.6	444.0	539.0
Total Hardness	36.0	26.0	56.0	60.0
Total Alkalinity	22.5	12.0	33.0	30.0
Nitrate+Nitrite as N	0.226	0.317	0.273	0.884
Nitrate NO <sub>3</sub>	0.226	0.311	0.261	0.884
Nitrite NO <sub>2</sub>	ND	0.006	0.012	ND
Ammonia NH <sub>3</sub>	ND	ND	0.056	ND
Total Phosphorus	ND	ND	ND	ND
Chlorides	40.8	18.8	48.6	65.2
Total Acidity	3.50	3.50	5.00	3.50
T.D.S.	170	92.0	224	270
T.S.S.	ND	ND	8.00	ND
Fecal Coliform	10 EST.	30 EST.	60 EST	220 EST.

ND - None Detected

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	LEHIRI01	LEHIRI02	TOBYCR01	SWIFCR07
Date	8/9/06	8/9/06	8/9/06	8/9/06
Time	0830	0915	1000	1030
Stream Name	Lehigh River	Lehigh River	Tobyhanna Creek	Swiftwater Creek
Weather	Sun	Sun	Sun	Sun
Volume of Flow (cfs)	46.63	35.51	15.24	5.57
Stream Temperature (°C)	16.7	16.5	19.6	13.5
Dissolved Oxygen	6.43	6.16	7.54	12.64
pH	Field / Lab 6.8 7.01	Field / Lab 6.9 7.03	Field / Lab 7.1 ---	Field / Lab 7.3 ---
Conductivity $\mu$ s/cm	120.5	124.1	227.0	160.9
Total Hardness	19.0	20.0	---	---
Total Alkalinity	8.50	8.50	---	---
Nitrate+Nitrite as N	0.098	0.170	---	---
Nitrate NO <sub>3</sub>	0.098	0.170	---	---
Nitrite NO <sub>2</sub>	ND	ND	---	---
Ammonia NH <sub>3</sub>	ND	ND	---	---
Total Phosphorus	ND	ND	---	---
Chlorides	11.3	11.7	---	---
Total Acidity	4.00	4.00	---	---
T.D.S.	60.3	62.2	114	80.5
T.S.S.	2.00	ND	---	---
Fecal Coliform	30 EST.	30 EST.	---	---

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	SWIFCR05	SWIFCR03	CRCRPA03	DRSARU01
Date	8/9/06	8/9/06	8/10/06	8/10/06
Time	1200	1230	0830	0930
Stream Name	Swiftwater Creek	Swiftwater Creek	Cranberry Creek	Dry Sawmill Run
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	7.92	10.50	0.58	1.72
Stream Temperature (°C)	17.3	16.0	16.3	15.7
Dissolved Oxygen	9.12	9.72	8.56	8.74
pH	Field / Lab 7.3 7.25	Field / Lab 7.3 7.09	Field / Lab 7.1 7.32	Field / Lab 7.3 7.29
Conductivity $\mu$ s/cm	325.0	168.6	362.0	194.0
Total Hardness	30.0	25.0	48.0	21.0
Total Alkalinity	20.5	8.00	25.5	9.00
Nitrate+Nitrite as N	0.463	0.386	0.478	0.198
Nitrate NO <sub>3</sub>	0.463	0.386	0.478	0.198
Nitrite NO <sub>2</sub>	ND	ND	ND	ND
Ammonia NH <sub>3</sub>	ND	ND	ND	ND
Total Phosphorus	ND	ND	ND	ND
Chlorides	39.9	26.8	36.3	23.6
Total Acidity	3.00	3.00	4.00	3.50
T.D.S.	162	84.2	180	97.0
T.S.S.	ND	ND	ND	ND
Fecal Coliform	<10 EST.	<10 EST	20 EST.	<10 EST.

ND - None Detected

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	POCOCR20	POCOCR16	POCOCR17	POCOCR19
Date	8/10/06	8/10/06	8/10/06	8/10/06
Time	1015	1100	1130	1200
Stream Name	Pocono Creek	Pocono Creek	Pocono Creek	Pocono Creek
Weather	Clear	Overcast	Clear	Clear
Volume of Flow (cfs)	14.57	10.53	10.52	9.18
Stream Temperature (°C)	15.3	16.4	17.3	18.4
Dissolved Oxygen	11.85	10.91	10.10	9.54
pH	Field / Lab 7.4 7.3	Field / Lab 7.3 7.23	Field / Lab 7.3 7.28	Field / Lab 7.3 7.31
Conductivity $\mu\text{s}/\text{cm}$	103.1	158.6	207.2	230.0
Total Hardness	15.0	22.0	28.0	35.0
Total Alkalinity	8.50	12.50	15.50	18.0
Nitrate+Nitrite as N	0.064	0.201	0.383	0.464
Nitrate NO <sub>3</sub>	0.064	0.201	0.383	0.464
Nitrite NO <sub>2</sub>	ND	ND	ND	ND
Ammonia NH <sub>3</sub>	ND	0.118	ND	ND
Total Phosphorus	ND	ND	ND	ND
Chlorides	11.3	16.3	23.4	29.4
Total Acidity	3.00	3.50	3.00	3.00
T.D.S.	51.20	79.30	103.1	115.0
T.S.S.	ND	ND	ND	ND
Fecal Coliform	10 EST.	10 EST.	80 EST.	30 EST.

ND - None Detected

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	SCOTCR04	POCOCR15	POCOCR18	POCOCR22
Date	8/11/06	8/11/06	8/11/06	8/11/06
Time	0800	0830	0900	0945
Stream Name	Scotrun Creek	Pocono Creek	Pocono Creek	Pocono Creek
Weather	Clear	Clear	Cloudy	Clear
Volume of Flow (cfs)	1.55	14.34	17.92	28.44
Stream Temperature (°C)	17.5	18.1	18.5	18.0
Dissolved Oxygen	7.83	9.34	9.55	9.24
pH	Field / Lab 6.8 7.29	Field / Lab 7.3 7.51	Field / Lab 7.7 7.64	Field / Lab 7.6 7.47
Conductivity $\mu\text{s}/\text{cm}$	314	345	358	357
Total Hardness	51.0	44.0	47.0	47.0
Total Alkalinity	29.5	25.5	27.0	27.5
Nitrate+Nitrite as N	0.253	0.524	0.453	0.518
Nitrate NO <sub>3</sub>	0.253	0.524	0.453	0.518
Nitrite NO <sub>2</sub>	ND	ND	ND	ND
Ammonia NH <sub>3</sub>	ND	ND	ND	ND
Total Phosphorus	ND	ND	ND	ND
Chlorides	43.2	37.9	38.3	39.0
Total Acidity	5.00	3.00	2.50	3.50
T.D.S.	156	179	179	166
T.S.S.	ND	ND	ND	ND
Fecal Coliform	60 EST.	340 EST	50 EST.	50 EST.

ND - None Detected

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	POCOCR14	MCMICR21	REDRU03	HAWKRU02
Date	8/11/06	8/11/06	8/14/06	8/14/06
Time	1045	1110	0800	0845
Stream Name	Pocono Creek	McMichael Creek	Red Run	Hawkey Run
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	20.48	78.04	0	2.83
Stream Temperature (°C)	20.2	20.4	11.7	15.1
Dissolved Oxygen	8.85	8.65	8.68	9.23
pH	Field / Lab 7.7 7.67	Field / Lab 7.7 ---	Field / Lab 6.9 ---	Field / Lab 6.7 6.87
Conductivity $\mu$ s/cm	447	360	207	195
Total Hardness	63.0	---	---	24.0
Total Alkalinity	36.0	---	---	7.00
Nitrate+Nitrite as N	0.553	---	---	0.387
Nitrate NO <sub>3</sub>	0.553	---	---	0.387
Nitrite NO <sub>2</sub>	ND	---	---	ND
Ammonia NH <sub>3</sub>	ND	---	---	ND
Total Phosphorus	ND	---	---	ND
Chlorides	45.4	---	---	26.2
Total Acidity	2.50	---	---	4.00
T.D.S.	225	182	104	97.2
T.S.S.	ND	---	---	ND
Fecal Coliform	30 EST.	---	---	40 EST.

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	TROUCR03	TOBYCR14	TUNKCR03	JONASCR01
Date	8/14/06	8/14/06	8/14/06	8/14/06
Time	0930	1030	1100	1130
Stream Name	Trout Creek	Tobyhanna Creek	Tunkhannock Creek	Jonas Creek
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	3.93	16.71	23.69	3.83
Stream Temperature (°C)	21.0	18.0	16.1	12.7
Dissolved Oxygen	8.07	9.64	10.10	11.28
pH	Field / Lab 6.9 ---	Field / Lab 7.0 6.94	Field / Lab 6.5 ---	Field / Lab 6.7 6.76
Conductivity $\mu\text{s}/\text{cm}$	101.4	136.5	81.5	78.2
Total Hardness	---	18.0	---	11.0
Total Alkalinity	---	8.00	---	4.00
Nitrate+Nitrite as N	---	0.138	---	0.280
Nitrate NO <sub>3</sub>	---	0.138	---	0.280
Nitrite NO <sub>2</sub>	---	ND	---	ND
Ammonia NH <sub>3</sub>	---	ND	---	ND
Total Phosphorus	---	ND	---	ND
Chlorides	---	15.6	---	7.98
Total Acidity	---	3.00	---	4.00
T.D.S.	47	68.4	40.8	39.2
T.S.S.	---	ND	---	ND
Fecal Coliform	---	10 EST.	---	<10 EST.

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	POHOCR08	WEIRCR02	POHOCR06	BUCKCR01
Date	8/15/05	8/15/06	8/15/06	8/16/06
Time	1245	0900	0930	1100
Stream Name	Pohopoco Creek	Weir Creek	Pohopoco Creek	Buckwha Creek
Weather	Rain	Overcast	Overcast	Overcast
Volume of Flow (cfs)	15.68	10.75	51.86	12.46
Stream Temperature (°C)	18.7	17.0	18.2	18.8
Dissolved Oxygen	8.32	6.43	8.63	7.78
pH	Field / Lab 7.0 6.77	Field / Lab 6.3 6.37	Field / Lab 6.9 ---	Field / Lab 7.2 7.11
Conductivity $\mu\text{s}/\text{cm}$	162.3	238	142.0	169.0
Total Hardness	27.0	39.0	---	38.0
Total Alkalinity	12.0	11.0	---	24.0
Nitrate+Nitrite as N	0.900	2.22	---	0.794
Nitrate NO <sub>3</sub>	0.878	2.21	---	0.788
Nitrite NO <sub>2</sub>	0.022	0.0070	---	0.006
Ammonia NH <sub>3</sub>	0.059	ND	---	ND
Total Phosphorus	0.071	ND	---	ND
Chlorides	15.6	20.6	---	8.51
Total Acidity	3.50	14.5	---	3.50
T.D.S.	81.2	120	70.8	84.5
T.S.S.	10.4	5.20	---	7.60
Fecal Coliform	13,000	1,100	---	1,200

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	AQUACR09	AQUACR10	MARSCR08	MARSCR09
Date	8/15/06	8/15/06	8/16/06	8/16/06
Time	1200	1230	0815	0845
Stream Name	Aquashicola Creek	Aquashicola Creek	Marshalls Creek	Marshalls Creek
Weather	Cloudy	Cloudy	Clear	Clear
Volume of Flow (cfs)	18.25	18.96	10.49	10.82
Stream Temperature (°C)	18.5	18.7	18.9	19.2
Dissolved Oxygen	9.05	8.99	6.92	8.20
pH	Field / Lab 7.7 ---	Field / Lab 7.9 7.60	Field / Lab 7.0 ---	Field / Lab 7.5 ---
Conductivity $\mu\text{s}/\text{cm}$	277	245	208	269
Total Hardness	---	67.0	---	---
Total Alkalinity	---	54.0	---	---
Nitrate+Nitrite as N	---	0.371	---	---
Nitrate NO <sub>3</sub>	---	0.371	---	---
Nitrite NO <sub>2</sub>	---	ND	---	---
Ammonia NH <sub>3</sub>	---	ND	---	---
Total Phosphorus	---	ND	---	--
Chlorides	---	6.56	---	---
Total Acidity	---	2.00	---	--
T.D.S.	140	124	104	136
T.S.S.	---	2.00	---	---
Fecal Coliform	---	980 EST.	---	---

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	SAMBCR10	BRODCR14	BRODCR15	CRANCR01
Date	8/16/06	8/16/06	8/16/06	8/16/06
Time	0900	0930	1015	1045
Stream Name	Sambo Creek	Brodhead Creek	Brodhead Creek	Cranberry Creek
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	4.18	66.78	67.68	0.82
Stream Temperature (°C)	18.4	19.4	20.2	17.7
Dissolved Oxygen	8.50	8.52	9.98	8.74
pH	Field / Lab 7.7 ---	Field / Lab 7.4 7.08	Field / Lab 7.3 7.18	Field / Lab 7.3 7.36
Conductivity $\mu\text{s}/\text{cm}$	461	195.8	197	738
Total Hardness	---	28.0	28.0	103
Total Alkalinity	---	15.5	16.0	57.0
Nitrate+Nitrite as N	---	0.234	0.238	7.23
Nitrate NO <sub>3</sub>	---	0.234	0.238	7.23
Nitrite NO <sub>2</sub>	---	ND	ND	ND
Ammonia NH <sub>3</sub>	---	ND	ND	ND
Total Phosphorus	---	ND	ND	1.71
Chlorides	---	18.6	18.8	54.6
Total Acidity	---	4.50	5.50	5.00
T.D.S.	233	97.9	98.6	370
T.S.S.	---	ND	ND	ND
Fecal Coliform	---	20 EST.	20 EST.	60 EST.

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	MCMICR28		BRODCR01		BRODCR12		BUSHCR07
Date	8/16/06		8/17/06		8/17/06		8/17/06
Time	1145		0815		0845		0945
Stream Name	McMichael Creek		Brodhead Creek		Brodhead Creek		Bushkill Creek
Weather	Clear		Clear		Clear		Cloudy
Volume of Flow (cfs)	34.57		20.42		56.04		56.56
Stream Temperature (°C)	19.6		18.5		18.5		19.1
Dissolved Oxygen	11.65		11.50		11.75		10.95
pH	Field / Lab 8.2 7.56		Field / Lab 7.2 ---		Field / Lab 7.3 ---		Field / Lab 7.2 ---
Conductivity $\mu$ s/cm	222		121.5		190		115.4
Total Hardness	45.0		---		---		---
Total Alkalinity	28.5		---		---		---
Nitrate+Nitrite as N	0.307		---		---		---
Nitrate NO <sub>3</sub>	0.302		---		---		---
Nitrite NO <sub>2</sub>	0.005		---		---		---
Ammonia NH <sub>3</sub>	ND		---		---		---
Total Phosphorus	ND		---		---		---
Chlorides	13.5		---		---		---
Total Acidity	4.00		---		---		---
T.D.S.	112		60.9		95.2		57.9
T.S.S.	3.20		---		---		---
Fecal Coliform	230 EST.		---		---		---

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
PHYSICAL/CHEMICAL DATA**

Site ID	BRODCR13	CHERCR11	MCMICR30	TUNKCR06
Date	8/17/06	8/17/06	8/17/06	9/6/06
Time	1030	1130	1200	1130
Stream Name	Brodhead Creek	Cherry Creek	McMichael Creek	Tunkhannock Creek
Weather	Clear	Clear	Clear	Clear
Volume of Flow (cfs)	120.15	20.52	83.75	**
Stream Temperature (°C)	20.6	18.8	21.1	16.3
Dissolved Oxygen	12.22	11.98	11.78	7.04
pH	Field / Lab 7.9 ---	Field / Lab 8.1 ---	Field / Lab 7.9 7.56	Field / Lab 5.3 ---
Conductivity $\mu\text{s}/\text{cm}$	325	492	438	77.3
Total Hardness	---	---	64.0	---
Total Alkalinity	---	---	46.5	---
Nitrate+Nitrite as N	---	---	1.11	---
Nitrate NO <sub>3</sub>	---	---	1.02	---
Nitrite NO <sub>2</sub>	---	---	0.091	---
Ammonia NH <sub>3</sub>	---	---	0.260	---
Total Phosphorus	---	---	1.10	---
Chlorides	---	---	35.1	---
Total Acidity	---	---	4.00	---
T.D.S.	163	248	220	38.8
T.S.S.	---	---	ND	---
Fecal Coliform	---	---	40 EST.	---

\*\* - No Flow taken

ND - None Detected

Sites that are tested annually and which consistently show good water quality did not have chemical samples taken for laboratory analysis.

**SURFACE WATER TEST SITES  
CHEMICAL DATA  
(HEAVY METALS)**

Site #	POCOCR22
Date	8/11/06
Time	0945
Stream Name	Pocono Creek
Iron	0.014
Nickel, Dissolved	0.003
Copper, Dissolved	ND
Cadmium, Dissolved	ND
Arsenic, Dissolved	ND
Lead, Dissolved	ND
Zinc, Dissolved	0.016

ND - None Detected