

LEVEL ONE WATER-QUALITY INVENTORY AND MONITORING
PETERSBURG NATIONAL BATTLEFIELD (PETE), VIRGINIA



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INTRODUCTION

The U.S. Geological Survey conducted a Level 1 Water-Quality Inventory and Monitoring (WAQIM) data-collection effort for Petersburg National Battlefield (PETE) from September 1998 through June 1999. The primary objective of the WAQIM program was to provide the National Park Service (NPS) and PETE with at least a nominal inventory of its natural resources and to provide those data in a data-management system consistent with park management needs. Water-quality inventory data (physical, chemical, and biological) were collected from “key” water bodies within the boundaries of PETE. The key water bodies are those waters within park boundaries that are essential to the central cultural, historical or natural resources management themes of the parks or provide habitats to threatened or endangered plants and animals. Data were collected during four different seasons (Fall, Winter, Spring, and Summer) over a range of hydrologic conditions. Because of the drought conditions that persisted during the study period, variations in flow between seasons were less pronounced than during normal hydrologic conditions.

Petersburg National Battlefield (PETE), which commemorates the final decisive campaign of the Civil War, comprises 2,460 acres primarily located on the eastern side of Petersburg, Virginia (fig. 4). The park contains three perennial streams: Harrison Creek, Poor Creek, and Hatchers Run. Harrison Creek and Poor Creek are located in the main unit of the park, although, the headwaters of both creeks are located outside of the park’s south boundary. Both streams flow across the main unit of the park, flow out of the park across its north boundary, and flow into the Appomattox River less than 2 miles north of the park. Land use adjacent to the boundary of the main unit of the park ranges from forested to heavily urbanized. Hatchers Run flows along the northern boundary of the Five Forks unit of the park, which is located about 12 miles southwest of Petersburg, and drains a forested and agricultural watershed.

Threats to water-quality in the park include urban development along the boundaries of the main unit of the park and agricultural activity in the Hatchers Run watershed. The primary water-quality threats include increased nutrient loading and bacteriological contamination of the streams in the park. Parameters most sensitive to these potential water-quality threats include nutrients and bacteria. Data-collection sites and the parameters analyzed were selected based on the spatial distribution of land-use activities inside and immediately outside of the park’s boundaries and the nature of the potential threats to park water-quality.

DESCRIPTION OF INVENTORY PROCESS

Site Descriptions

The water-quality inventory for PETE included the periodic collection of physical, chemical, and microbiological data from two sites on Harrison Creek, two sites on Poor

Creek (fig. 1) and one site on Hatchers Run (fig. 2). These sites are: (1) Harrison Creek at Siege Road at Petersburg, Va (02041758), (2) Harrison Creek at Highway 36 at Petersburg, Va (02041760), (3) Poor Creek at Highway 460 at Petersburg, Va (02041748), (4) Poor Creek near Blandford Cemetery at Petersburg, Va (02041748), and (5) Hatchers Run at Route 627 near Five Forks, Va (02046265).

Harrison Creek at Siege Road at Petersburg, VA (02041758) is located approximately 50 feet downstream from Siege Road in the main unit of the park. Stream width is typically less than 8 feet. The surrounding area is moderately wooded. Access is via Siege Road, approximately 1.3 miles from Visitor Center. Harrison Creek at Highway 36 at Petersburg, Va (02041760) is located at the north boundary of the main unit of the park approximately 150 feet downstream from Highway 36. Stream width is typically less than 8 feet. The surrounding area is moderately wooded. Access is via Highway 36, approximately 0.5 miles east of the park entrance. Poor Creek at Highway 460 at Petersburg, Va (02041748) is located immediately south of the main unit's south boundary approximately 45 feet downstream from US 460. Stream width is typically less than 8 feet. The surrounding area is moderately wooded. Access is via Siege Road, approximately 2.85 miles from Visitor Center. Poor Creek near Blandford Cemetery at Petersburg, Va (02041748) is located in main unit of park near the park's northwest boundary. Stream width is typically less than 15 feet. The surrounding area is moderately wooded. Access is via Siege Road, approximately 1.55 miles inside of PETE and through Colquit's Salient. Hatchers Run at Route 627 near Five Forks, VA (02046265) is located in the Five Forks unit of the park approximately 30 feet downstream from State Route 627. Stream width is typically less than 15 feet. The surrounding area includes lightly wooded stream banks, beaver activity, light rural development, and agriculture. Access is from State Route 627, southeast of US460, approximately 20 miles southwest of Petersburg City.

Description of Data Collection

Data-collection activities were conducted in September and December 1998 and February and June 1999 (table 1). Data-collection and analysis were conducted according to standard USGS protocols (U.S. Geological Survey, 1997, 1998, 1999; Rantz and others, 1982). Stream water-quality samples were collected as point samples or cross-sectional depth-integrated samples, depending on streamflow conditions. Discharge, water temperature, pH, specific conductivity, dissolved oxygen, and alkalinity were measured at every site on every visit. Water samples were collected and analyzed for nutrients and bacteria at every site on every visit. Samples were collected and analyzed for major ion and trace element analysis on one visit.

PRINCIPAL INVESTIGATORS

The principal investigators of the WAQIM program included staff of the U.S. Geological Survey (USGS), Water Resources Division (WRD) district office in Richmond, Virginia. Michael E. Lewis, Supervisory Hydrologist, supervised all work. J. Michael Gearheart, Hydrologic Technician, implemented all fieldwork. All water-quality samples collected as part of the inventory, with the exception of bacteriological samples, were submitted for analysis to the USGS National Water Quality Laboratory (NWQL) in Denver, Colorado. Bacteriological samples were processed by field personnel at each site and analyzed in the Richmond, Virginia office of the USGS.

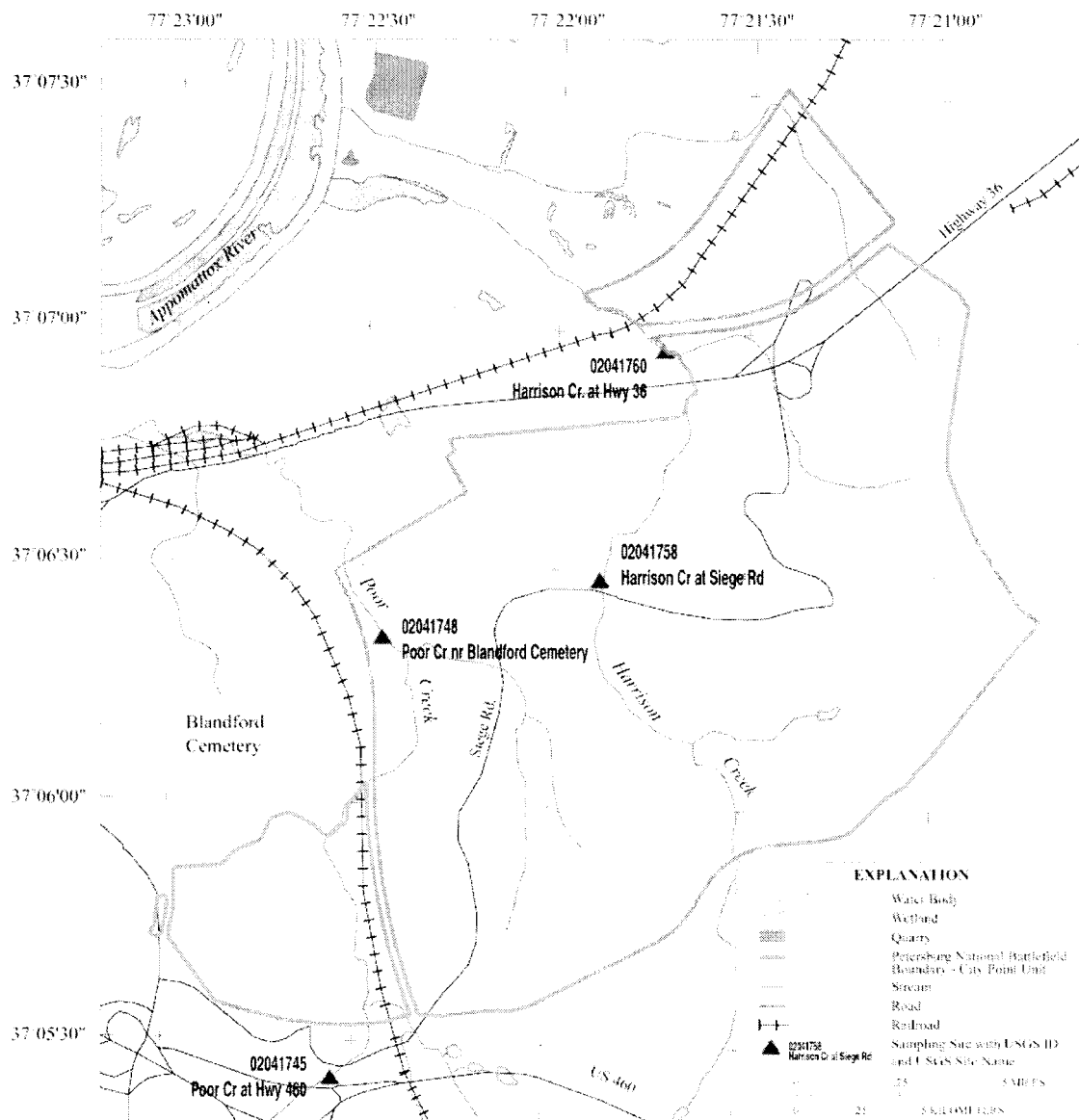


Figure 1. Map of main unit study area and data-collection sites.

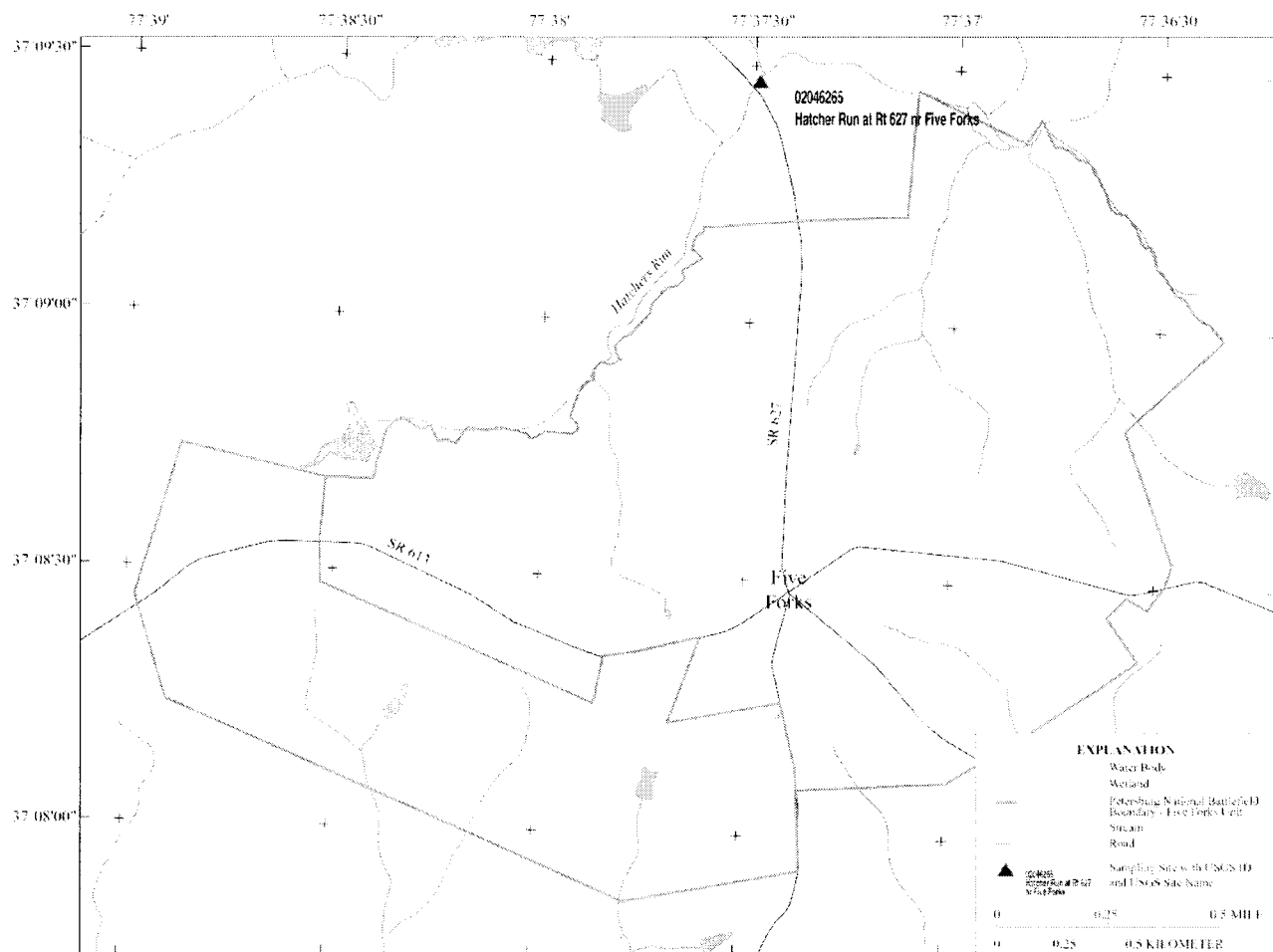


Figure 2. Map of Five Forks unit study area and data-collection sites.

Table 1. Data-collection schedule

Parameter	Data collection period			
	September 1998	December 1998	February 1999	June 1999
Field parameters	X	X	X	X
Fecal bacteria	X	X	X	X
Nutrients	X	X	X	X
Major Ions	X			
Trace elements				X

WATER-QUALITY RESULTS

Tables 2-6 provide all physical, microbiological, and chemical data collected as part of the PETE WAQIM project. Four additional files of supporting documentation are included as attachments to this report:

- (1) "PETE ATTACHMENT 1 SITES.XLS";
- (2) "PETE ATTACHMENT 2 PARMS.DOC";
- (3) "PETE ATTACHMENT 3 DATA.XLS", and
- (4) "README.DOC"

"PETE Attachment 1 sites.xls" is a Microsoft Excel file that contains specific location information for each site where water-quality data were collected. "PETE Attachment 2 parms.doc" is a Microsoft Word file that explicitly defines each water-quality parameter included in the tables of this report and also in the water-quality data spreadsheet. "PETE Attachment 3 data.xls" is a Microsoft Excel spreadsheet that contains all water-quality data collected during this study. "Readme.doc" is a Microsoft Word file that contains basic information related to the project, such as contact information for those who conducted the work and analyzed the samples.

Table 2. Field parameter data

[ft³/s, cubic feet per second; °C, degrees Celsius; uS/cm, microsiemens per centimeter at 25 °C; mg/L, milligrams per liter; mg/L as CaCO₃, milligrams per liter as calcium carbonate]

Date	Time	Discharge (ft ³ /s)	Water temperature (°C)	pH (units)	Specific conductance (uS/cm)	Dissolved oxygen (mg/L)	Alkalinity (mg/L as CaCO ₃)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)							
Sept 9, 1998	12:30	0.001	18.0	7.5	143	8.2	46
Dec 8, 1998	11:15	0.02	15.7	7.5	180	7.7	53
Feb 9, 1999	11:35	0.33	6.3	7.8	184	12.4	38
June 22, 1999	9:35	0.120	17.8	6.8	149	8.2	50.2
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)							
Sept 9, 1998	9:30	0.10	17.3	6.8	81	7.5	30
Dec 8, 1998	8:45	0.14	16.1	6.7	81	6.7	20
Feb 9, 1999	13:50	0.58	9.5	7.3	138	10.6	29
June 22, 1999	12:00	0.179	18.2	6.8	103	6.6	30.5
Poor Creek at Hwy 460 at Petersburg, VA (02041745)							
Sept 10, 1998	10:00	0.09	19.2	7.4	185	7.5	39
Dec 9, 1998	10:00	1.2	13.0	6.9	84	9.3	12
Feb 10, 1999	9:30	0.14	7.5	7.6	305	11.3	44
June 23, 1999	10:30	0.026	17.9	7.2	217	6.9	51.0
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)							
Sept 9, 1998	15:30	0.10	18.6	7.3	163	8.0	40
Dec 8, 1998	13:30	0.07	16.1	7.5	240	7.8	62
Feb 10, 1999	12:25	0.65	9.1	7.5	241	11.8	27
June 23, 1999	13:00	0.133	19.4	7.6	183	7.0	44.0
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)							
Sept 10, 1998	13:10	0.03	22.3	6.6	79	5.1	11
Dec 9, 1998	13:20	0.54	13.4	6.2	117	5.4	10
Feb 9, 1999	9:00	3.5	5.9	6.3	51	8.3	6
June 22, 1999	14:45	3.68	21.0	6.2	53	3.6	13.2

Table 3. Bacteria data.

[col/100 ml; colonies per 100 milliliters; e, estimated value; >, greater than;
K, non-ideal colony count, *, exceeds State water quality standard]

Date	Time	Total coliform (col/100 ml)	Fecal coliform (col/100 ml)	Fecal streptococcus (col/100 ml)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)				
Sept 9, 1998	12:30	650	520	500
Dec 8, 1998	11:15	770	430	1,000
Feb 9, 1999	11:35	190	23K	85K
June 22, 1999	9:35	620	620	2,500
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)				
Sept 9, 1998	9:30	>270	1,100 *	540
Dec 8, 1998	8:45	140K	65K	630
Feb 9, 1999	13:50	1,200	40K	48K
June 22, 1999	12:00	1,600	400	940
Poor Creek at Hwy 460 at Petersburg, VA (02041745)				
Sept 10, 1998	10:00	2,700K	2,000K *	650
Dec 9, 1998	10:00	20,000K	20,000K *	10,000
Feb 10, 1999	9:30	1,300	>180	690
June 23, 1999	10:30	4,300	1,475K *	1,120
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)				
Sept 9, 1998	15:30	1,900K	>210	1,200
Dec 8, 1998	13:30	3,000	110K	300
Feb 10, 1999	12:25	450	39K	35K
June 23, 1999	13:00	3,100	260	350
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)				
Sept 10, 1998	13:10	450	450	8K
Dec 9, 1998	13:20	7,500	5,800 *	2,500
Feb 9, 1999	9:00	940	30K	36K
June 22, 1999	14:45	6,100	177	1,060

Table 4. Nutrient data

[mg/L, milligrams per liter; N, nitrogen; P, phosphorous;
 < less than; e, estimated value]

Date	Time	Nitrogen, nitrite, dissolved (mg/L as N)	Nitrogen, nitrate + nitrite, dissolved (mg/L as N)	Nitrogen, ammonia, dissolved (mg/L as N)	Nitrogen, ammonia + organic, total (mg/L as N)	Nitrogen, ammonia + organic, dissolved (mg/L as N)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)						
Sept 9, 1998	12:30	<0.010	<0.050	<0.020	0.24	0.17
Dec 8, 1998	11:15	<0.01	<0.05	<0.02	0.2	0.2
Feb 9, 1999	11:35	<0.01	<0.05	<0.02	0.2	0.1
June 22, 1999	9:35	<0.01	0.08	0.03	0.3	0.2
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)						
Sept 9, 1998	9:30	<0.010	0.081	0.085	0.15	0.13
Dec 8, 1998	8:45	<0.01	0.06	0.03	0.2	0.1
Feb 9, 1999	13:50	<0.01	<0.05	0.04	0.2	0.1
June 22, 1999	12:00	<0.01	0.08	0.06	0.3	0.2
Poor Creek at Hwy 460 at Petersburg, VA (02041745)						
Sept 10, 1998	10:00	0.031	0.316	0.410	0.65	0.63
Dec 9, 1998	10:00	0.01	0.27	0.07	0.5	0.5
Feb 10, 1999	9:30	<0.01	0.2	0.04	0.3	0.2
June 23, 1999	10:30	0.01	0.22	0.04	0.4	0.3
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)						
Sept 9, 1998	15:30	0.01	0.185	0.205	0.35	0.33
Dec 8, 1998	13:30	<0.01	<0.05	<0.02	0.2	0.2
Feb 10, 1999	12:25	<0.01	0.11	0.03	0.2	0.1
June 23, 1999	13:00	<0.01	0.12	0.03	0.3	0.2
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)						
Sept 10, 1998	13:10	<0.010	<0.050	0.04	0.83	0.53
Dec 9, 1998	13:20	<0.01	0.09	<0.02	0.4	0.4
Feb 9, 1999	9:00	<0.01	<0.05	<0.02	0.3	0.3
June 22, 1999	14:45	<0.01	<0.05	<0.02	0.7	0.5

Table 4. Nutrient data--Continued.

[mg/L, milligrams per liter; N, nitrogen; P, phosphorous;

< less than; e, estimated value]

Date	Time	Phosphorus, total (mg/L as P)	Phosphorus, dissolved (mg/L as P)	Orthophosphate, dissolved (mg/L as P)
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Harrison Creek at Siege Rd at Petersburg, VA (02041758)

Sept 9, 1998	12:30	0.046	<0.010	0.019
Dec 8, 1998	11:15	0.05e	0.03e	0.03
Feb 9, 1999	11:35	0.0132	0.0052	<0.01
June 22, 1999	9:35	0.037	0.02	0.02

Harrison Creek at Hwy 36 at Petersburg, VA (02041760)

Sept 9, 1998	9:30	0.036	0.029	0.029
Dec 8, 1998	8:45	0.08	<0.05	0.02
Feb 9, 1999	13:50	0.024	0.0151	0.02
June 22, 1999	12:00	0.053	0.022	0.03

Poor Creek at Hwy 460 at Petersburg, VA (02041745)

Sept 10, 1998	10:00	0.085	0.058	0.061
Dec 9, 1998	10:00	0.08	0.07	0.08
Feb 10, 1999	9:30	0.0219	0.0054	<0.01
June 23, 1999	10:30	0.064	0.015	0.02

Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)

Sept 9, 1998	15:30	0.05	0.048	0.028
Dec 8, 1998	13:30	0.05e	<0.05	0.02
Feb 10, 1999	12:25	0.018	<0.004	<0.01
June 23, 1999	13:00	0.04	0.015	0.02

Hatchers Run at Rt 627 nr Five Forks, VA (02046265)

Sept 10, 1998	13:10	0.034	<0.010	<0.010
Dec 9, 1998	13:20	0.03e	<0.05	0.01
Feb 9, 1999	9:00	0.015	0.006	<0.01
June 22, 1999	14:45	0.063	0.009	<0.01

Table 5. Major-element data.
[mg/l, milligrams per liter; --, no data]

Date	Time	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Alkalinity (mg/L as CaCO ₃)	Sulfate, dissolved (mg/L as SO ₄)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)							
Sept 9, 1998	12:30	18	2.0	5.9	2.8	49	8.5
Dec 8, 1998	11:15	--	--	--	--	--	--
Feb 9, 1999	11:35	--	--	--	--	--	--
June 22, 1999	9:35	--	--	--	--	--	--
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)							
Sept 9, 1998	9:30	6.9	1.2	4.5	2.1	30	2.7
Dec 8, 1998	8:45	--	--	--	--	--	--
Feb 9, 1999	13:50	--	--	--	--	--	--
June 22, 1999	12:00	--	--	--	--	--	--
Poor Creek at Hwy 460 at Petersburg, VA (02041745)							
Sept 10, 1998	10:00	20	2.7	8.4	3.0	42	16
Dec 9, 1998	10:00	--	--	--	--	--	--
Feb 10, 1999	9:30	--	--	--	--	--	--
June 23, 1999	10:30	--	--	--	--	--	--
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)							
Sept 9, 1998	15:30	17	3.0	7.2	3.0	39	18
Dec 8, 1998	13:30	--	--	--	--	--	--
Feb 10, 1999	12:25	--	--	--	--	--	--
June 23, 1999	13:00	--	--	--	--	--	--
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)							
Sept 10, 1998	13:10	4.5	1.5	5.1	2.3	12	13
Dec 9, 1998	13:20	--	--	--	--	--	--
Feb 9, 1999	9:00	--	--	--	--	--	--
June 22, 1999	14:45	--	--	--	--	--	--

Table 5. Major-element data—Continued.
[mg/l, milligrams per liter, <, less than; --no data]

Date	Time	Chloride, dissolved (mg/l as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO ₂)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)				
Sept 9, 1998	12:30	7.3	0.15	16
Dec 8, 1998	11:15	--	--	--
Feb 9, 1999	11:35	--	--	--
June 22, 1999	9:35	--	--	--
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)				
Sept 9, 1998	9:30	6.8	<0.10	18
Dec 8, 1998	8:45	--	--	--
Feb 9, 1999	13:50	--	--	--
June 22, 1999	12:00	--	--	--
Poor Creek at Hwy 460 at Petersburg, VA (02041745)				
Sept 10, 1998	10:00	14	0.69	17
Dec 9, 1998	10:00	--	--	--
Feb 10, 1999	9:30	--	--	--
June 23, 1999	10:30	--	--	--
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)				
Sept 9, 1998	15:30	10	0.48	19
Dec 8, 1998	13:30	--	--	--
Feb 10, 1999	12:25	--	--	--
June 23, 1999	13:00	--	--	--
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)				
Sept 10, 1998	13:10	4.3	0.12	10
Dec 9, 1998	13:20	--	--	--
Feb 9, 1999	9:00	--	--	--
June 22, 1999	14:45	--	--	--

Table 6. Trace-element data.

[ug/L, micrograms per liter; <, less than; --, no data]

Date	Time	Aluminum, total (ug/L as Al)	Arsenic, total (ug/L as As)	Barium, total (ug/L as Ba)	Beryllium, total (ug/L as Be)	Cadmium, total (ug/L as Cd)	Chromium, total (ug/L as Cr)	Cobalt, total (ug/L as Co)	Copper, total (ug/L as Cu)	Iron, total (ug/L as Fe)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)										
Sept 9, 1998	12:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	11:15	--	--	--	--	--	--	--	--	--
Feb 9, 1999	11:35	--	--	--	--	--	--	--	--	--
June 22, 1999	9:35	84.3	1	46.0	<4	<1	<1.0	<1	1	783
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)										
Sept 9, 1998	9:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	8:45	--	--	--	--	--	--	--	--	--
Feb 9, 1999	13:50	--	--	--	--	--	--	--	--	--
June 22, 1999	12:00	47.9	1	38.3	<4	<1	<1.0	1	2	975
Poor Creek at Hwy 460 at Petersburg, VA (02041745)										
Sept 10, 1998	10:00	--	--	--	--	--	--	--	--	--
Dec 9, 1998	10:00	--	--	--	--	--	--	--	--	--
Feb 10, 1999	9:30	--	--	--	--	--	--	--	--	--
June 23, 1999	10:30	69.8	<1	39.5	<4	<1	<1.0	1	1	926
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)										
Sept 9, 1998	15:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	13:30	--	--	--	--	--	--	--	--	--
Feb 10, 1999	12:25	--	--	--	--	--	--	--	--	--
June 23, 1999	13:00	67.2	1	39.4	<4	<1	<1.0	<1	1	739
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)										
Sept 10, 1998	13:10	--	--	--	--	--	--	--	--	--
Dec 9, 1998	13:20	--	--	--	--	--	--	--	--	--
Feb 9, 1999	9:00	--	--	--	--	--	--	--	--	--
June 22, 1999	14:45	137	2	44.0	<4	1	1.5	2	3	6,690

Table 6. Trace-element data—Continued.

[ug/L, micrograms per liter; <, less than; --, no data; *, minimum reporting limit is above chronic toxicity standard]

Date	Time	Lead, total (ug/L as Pb)	Lithium, total (ug/L as Li)	Manganese total (ug/L as Mn)	Mercury, total (ug/L as Hg)	Molyb- denum, total (ug/L as Mo)	Nickel, total (ug/L as Ni)	Selenium, total (ug/L as Se)	Silver, total (ug/L as Ag)	Zinc, total (ug/L as Zn)
Harrison Creek at Siege Rd at Petersburg, VA (02041758)										
Sept 9, 1998	12:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	11:15	--	--	--	--	--	--	--	--	--
Feb 9, 1999	11:35	--	--	--	--	--	--	--	--	--
June 22, 1999	9:35	<1	<12	37.9	<0.1 *	1.2	<1	<1	<1	<40
Harrison Creek at Hwy 36 at Petersburg, VA (02041760)										
Sept 9, 1998	9:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	8:45	--	--	--	--	--	--	--	--	--
Feb 9, 1999	13:50	--	--	--	--	--	--	--	--	--
June 22, 1999	12:00	<1	<12	105	<0.1 *	<1.0	1	1	<1	<40
Poor Creek at Hwy 460 at Petersburg, VA (02041745)										
Sept 10, 1998	10:00	--	--	--	--	--	--	--	--	--
Dec 9, 1998	10:00	--	--	--	--	--	--	--	--	--
Feb 10, 1999	9:30	--	--	--	--	--	--	--	--	--
June 23, 1999	10:30	<1	<12	64.9	<0.1 *	<1.0	2	<1	<1	<40
Poor Creek near Blandford Cemetery at Petersburg, VA (02041748)										
Sept 9, 1998	15:30	--	--	--	--	--	--	--	--	--
Dec 8, 1998	13:30	--	--	--	--	--	--	--	--	--
Feb 10, 1999	12:25	--	--	--	--	--	--	--	--	--
June 23, 1999	13:00	<1	<12	39.7	<0.1 *	1	2	<1	<1	<40
Hatchers Run at Rt 627 nr Five Forks, VA (02046265)										
Sept 10, 1998	13:10	--	--	--	--	--	--	--	--	--
Dec 9, 1998	13:20	--	--	--	--	--	--	--	--	--
Feb 9, 1999	9:00	--	--	--	--	--	--	--	--	--
June 22, 1999	14:45	<1	<12	421	<0.1 *	<1.0	<1	<1	<1	<40

GENERAL CLIMATIC AND HYDROLOGIC CONDITIONS

Most of the period of study occurred within the 1999 water year, October 1, 1998, through September 30, 1999. Published statistics (White and others, 1998, 1999) show that across Virginia low streamflows in the summer months of 1998 continued to decrease during the autumn to levels below the normal range for that time of year. Normal precipitation in the winter months of 1999 generally increased streamflows to levels in the normal range, but below median monthly flow. In the spring and summer of 1999, streamflows continued to decline to levels comparable to the four most severe drought periods since the early 1900's: the droughts of 1930-32, 1938-42, 1962-71, and 1980-82.

Analysis of streamflow records provided by the Virginia Department of Environmental Quality for two indicator gages located near the PETE study area shows that for Stony Creek near Dinwiddie, Va. (02046000), the annual mean streamflow for water year 1999 is 70 percent of the 54-year annual mean; and for Deep Creek near Mannboro, Va. (02041000), annual mean streamflow for water year 1999 is 63 percent of the 54-year annual mean. At both gages, drought conditions were reduced in September by precipitation from two hurricanes (Dennis and Floyd) and a cold front. Records beginning in 1947 show that drought conditions at both gages were not as severe as the drought of 1962-71 nor the drought of 1980-82.

EXCEEDENCES OF STATE WATER-QUALITY STANDARDS

In the PETE study area, all water-quality measurements are within the surface water standards established by the Virginia State Water Control Board (1997), except as noted below.

Fecal coliform: Of 20 measurements of fecal coliform bacteria made in the study area, 5 measurements exceeded the standard of 1,000 bacteria per 100 milliliters (ml.). Bacteria counts of 1,960 per 100 ml., 20,000 per 100 ml., and 1,475 per 100 ml. were measured at station 02041745 (Poor Creek at Highway 460) on September 10, 1998, December 9, 1998, and June 23, 1999, respectively. One count of 1,120 bacteria per 100 ml. was measured at station 02041760 (Harrison Creek) on September 9, 1998; and one count of 5,800 bacteria per 100 ml. was measured at station 02046265 (Hatcher Run) on December 9, 1999.

Dissolved oxygen: Of 20 measurements of dissolved oxygen concentration made in the study area, 1 measurement is less than the minimum standard of 4.0 milligrams per liter (mg/L) for streamwater in the Piedmont zone. Dissolved oxygen concentration of 3.61 mg/L was measured at station 02046265 (Hatcher Run) on June 22, 1999.

Mercury: Of 5 measurements of total mercury concentration made in the study area, 5 are reported as less than 0.1 micrograms per liter (ug/L), the minimum reporting level. The most restrictive standard limiting mercury concentration is the chronic toxicity limit for freshwater aquatic life, 0.012 ug/L. No inferences can be made about exceedence of this standard because the analytical determination is not meaningful in this concentration range. None of the samples, however, exceeded the acute toxicity limit for freshwater aquatic life, 2.4 ug/L.

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- U.S. Geological Survey, 1997, 1998, 1999, National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9.
- Virginia State Water Control Board, 1997, Surface water standards with general, statewide application: Code of Virginia, 9 VAC 25-260-5 et seq. Water Quality Standards.
- White, R.K., Hayes, D.C., Eckenwiler, M.R., and Herman, P.E., 1998, Water resources data, Virginia, water year 1998: U.S. Geological Survey Water-Data Report VA-98-1, 577 p.
- White, R.K., Hayes, D.C., Eckenwiler, M.R., and Herman, P.E., 1999, Water resources data, Virginia, water year 1999: U.S. Geological Survey Water-Data Report VA-99-1, 546 p.

TABLE 1. SITES AT PETE

Station Name	Station ID	Station Type	Description	Purpose	Latitude	Longitude
Harrison Creek at Siege Rd at Peter	02041758	Stream	Station is in PETE at City Unit. Stream width is typically less than 8 feet. Surrounding area is moderately wooded with tour road passing 50 feet upstream. Access is via Siege Road, approximately 1.3 miles from Visitor Center.	Station is monitored as it is part of one of the park's key water bodies.	37°13'58"	77°21'50"
Harrison Creek at Hwy 36 at Petersl	02041760	Stream	Station is on northern boundary of PETE at City Unit. Stream width is typically less than 8 feet. Surrounding area is moderately wooded. Parking lots are upgradient and US 36 is upstream by approximately 150 feet. Access is via Hwy 36, approximately 0.5 miles east of PETE entrance.	Station is monitored as it is part of one of the park's key water bodies.	37°14'25"	77°21'50"
Poor Creek at Hwy 460 at Petersbur	02041745	Stream	Station is in PETE at City Unit. Stream width is typically less than 8 feet. Surrounding area is moderately wooded with US 460 passing less than 50 feet upstream with lift station nearby. Access is via Siege Road, approximately 2.85 miles from Visitor Center.	Station is monitored as it is part of one of the park's key water bodies.	37°12'56"	77°22'29"
Poor Creek nr Blandford Cemetery :	02041748	Stream	Station is in PETE at City Unit. Stream width is typically less than 15 feet. Surrounding area is moderately wooded, with railroad tracks adjacent to stream by less than 100 feet. Access is via Siege Road , approximately 1.55 miles inside of PETE and through Colquit's Salient, approximately 0.25 miles.	Station is monitored as it is part of one of the park's key water bodies.	37°13'49"	77°22'32"

TABLE 1. SITES AT PETE

Method of Determining Lat/	Map Scale	Referenced Datum	State	County	HUC	Elevation feet	Elevation Source	Elevation Datum
Manual map interpolatio	1:24000	NAD1927	Virginia	Petesburg City	02080207	40	Topographic map	Gage
Manual map interpolatio	1:24000	NAD1927	Virginia	Petesburg City	02080207	10	Topographic map	Gage
Manual map interpolatio	1:24000	NAD1927	Virginia	Petesburg City	02080207	90	Topographic map	Gage
Manual map interpolatio	1:24000	NAD1927	Virginia	Petesburg City	02080207	35	Topographic map	Gage

TABLE 1. SITES AT PETE

Secondary Name(s)

TABLE 1. SITES AT PETE

Hatchers Run at Rt 627 nr Five Fork	02046265	Stream	Station is near PETE at Five Forks boundary. Stream width is typically less than 15 feet. Surrounding area includes SR 627 upstream by 30 feet, lightly wooded stream banks, beaver activity, light rural development, and agriculture. Access is from SR 627, southeast of US460, approximately 20 miles southwest of Petersburg City.	Station is monitored as it is part of one of the park's key water bodies.	37°09'20"	77°37'32"
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TABLE 1. SITES AT PETE

Manual map interpolatio	1:24000	NAD1927	Virginia	Dinwiddie	03010201	220	Topographic map	Gage
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TABLE 1. SITES AT PETE

TABLE 3. WQ PARAMETERS AT PETE

PARAMETER NAME	Discharge (Q)
SAMPLE FRACTION	total
MEASUREMENT UNITS	cubic feet per second (cfs)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	calculated
PREPARATION PROCEDURES	spin test
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	current meter method; USGS
FIELD/LAB EQUIPMENT OR PROCEDURE	Wading rod and pygmy(P90267) or Price AA(A91114) velocity meter
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)
PARAMETER NAME	Water Temperature (WT)
SAMPLE FRACTION	total
MEASUREMENT UNITS	degrees Celsius (°C)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	actual
PREPARATION PROCEDURES	calibration check w/ ASTM thermometer
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	--
FIELD/LAB EQUIPMENT OR PROCEDURE	thermometer (YSI50B DO W#496703)
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)
PARAMETER NAME	Hydrogen Ion Activity (pH)
SAMPLE FRACTION	total

TABLE 3. WQ PARAMETERS AT PETE

MEASUREMENT UNITS	pH units
FIELD/LAB MEASUREMENT	field
VALUE TYPE	actual
PREPARATION PROCEDURES	calibration w/ pH buffers 4, 7, 10
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	--
FIELD/LAB EQUIPMENT OR PROCEDURE	Beckman 12 pH meter (W#563868)
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)

PARAMETER NAME	Hydrogen Ion Activity (pH)
SAMPLE FRACTION	total
MEASUREMENT UNITS	pH units
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	electrometric electrode, pH, lab
DETECTION LIMIT	0.100
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Specific Conductance (SC)
SAMPLE FRACTION	total
MEASUREMENT UNITS	microsiemens per centimeter (uS/cm)
FIELD/LAB MEASUREMENT	field

TABLE 3. WQ PARAMETERS AT PETE

VALUE TYPE	actual
PREPARATION PROCEDURES	calibration with SC standards 50 - 500
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	--
FIELD/LAB EQUIPMENT OR PROCEDURE	Orion 122 SC meter (W#593055)
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)
PARAMETER NAME	Specific Conductance (SC)
SAMPLE FRACTION	total
MEASUREMENT UNITS	microsiemens per centimeter (uS/cm)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Wheatstone Bridge, Specific conductance, lab, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Dissolved Oxygen (DO)
SAMPLE FRACTION	total
MEASUREMENT UNITS	milligrams per liter (mg/L)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	actual

TABLE 3. WQ PARAMETERS AT PETE

PREPARATION PROCEDURES	zero DO check, atmospheric calibration in water
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	--
FIELD/LAB EQUIPMENT OR PROCEDURE	YSI 50B DO meter (W#496703)
DETECTION LIMIT	0.0
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)

PARAMETER NAME	Alkalinity
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as CaCO ₃ (mg/L as CaCO ₃)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	calculated
PREPARATION PROCEDURES	filtration of water samples, 0.45 microns
TRANSPORT/PRESERVATION	--
LAB ANALYTICAL PROCEDURE; SOURCE	titration with H ₂ SO ₄
FIELD/LAB EQUIPMENT OR PROCEDURE	Hach alkalinity kit
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)

PARAMETER NAME	Acid Neutralizing Capacity (ANC)
SAMPLE FRACTION	total
MEASUREMENT UNITS	milligrams per liter as CaCO ₃ (mg/L as CaCO ₃)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	calculated
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	untreated, cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Electrometric Titration, Acid Neutralizing Capacity as CaCO ₃ , lab, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Nitrogen, ammonia
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as nitrogen (mg/L as N)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; Salicylate-hypochlorite
DETECTION LIMIT	0.02
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Nitrogen, ammonia + organic nitrogen
SAMPLE FRACTION	total
MEASUREMENT UNITS	milligrams per liter as nitrogen (mg/L as N)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	whole water sample
TRANSPORT/PRESERVATION	acidified to pH<2 with H ₂ SO ₄ , cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; microkjeldahl digestion
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Nitrogen, ammonia + organic nitrogen
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as nitrogen (mg/L as N)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; microkjeldahl digestion
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Nitrogen, nitrite
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as nitrogen (mg/L as N)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry
DETECTION LIMIT	0.01
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Nitrogen, nitrite + nitrate
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as nitrogen (mg/L as N)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry, cadmium reduction-diazotization
DETECTION LIMIT	0.05
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Phosphorous
SAMPLE FRACTION	total
MEASUREMENT UNITS	milligrams per liter as phosphorous (mg/L as P)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	whole water sample
TRANSPORT/PRESERVATION	acidified to pH<2 with H ₂ SO ₄ , cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; microkjeldahl digestion
DETECTION LIMIT	0.01
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Phosphorous
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as phosphorous (mg/L as P)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; microkjeldahl digestion
DETECTION LIMIT	0.01
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Phosphorous, phosphate, ortho
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as phosphorous (mg/L as P)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	untreated, cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S2702 NAWQA, Nutrients + Microkjeldahl P and N; Inorganics: Nutrients; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry; phosphomolybdate
DETECTION LIMIT	0.01
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Boron
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	micrograms per liter as boron (ug/L as B)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
MAX/MIN QUANTIFICATION LIMITS	
DETECTION LIMIT	16
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Calcium
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as calcium (mg/L as Ca)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
DETECTION LIMIT	0.02
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Chloride
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as chloride (mg/L as Cl)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Ion chromatography (IC)
MAX/MIN QUANTIFICATION LIMITS	
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Fluoride
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as fluoride (mg/L as F)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF), ion selective electrode
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Iron
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	micrograms per liter as iron (ug/L as Fe)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
DETECTION LIMIT	10
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Magnesium
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as magnesium (mg/L as Mg)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics:

TABLE 3. WQ PARAMETERS AT PETE

	Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
MAX/MIN QUANTIFICATION LIMITS	
DETECTION LIMIT	0.004
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Manganese
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	micrograms per liter as manganese (ug/L as Mn)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
DETECTION LIMIT	4
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory
PARAMETER NAME	Potassium
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as potassium (mg/L as K)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Atomic absorption (AA), flame
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Silica
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter is silica dioxide (mg/L as SiO ₂)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Automated-segmented flow (ASF) colorimetry, molybdate blue
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Sodium
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as sodium (mg/L as Na)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ , cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Inductively Coupled Plasma (ICP)
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Sulfate
SAMPLE FRACTION	dissolved
MEASUREMENT UNITS	milligrams per liter as sulfate (mg/L as SO ⁴)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S11 USGS National Water-Quality Laboratory Major Ions + Trace (Swapper); Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	Ion chromatography (IC)
DETECTION LIMIT	0.1
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Chromium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as chromium (ug/L as Cr)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, chromium, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Arsenic
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as arsenic (ug/L as As)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, arsenic, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Cadmium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as cadmium (ug/L as Cd)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, cadmium, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Molybdenum
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as molybdenum (ug/L as Mo)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, molybdenum, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Zinc
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as zinc (ug/L as Zn)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C

TABLE 3. WQ PARAMETERS AT PETE

LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	ZINC WWR-ICP
MAX/MIN QUANTIFICATION LIMITS	
DETECTION LIMIT	40
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Nickel
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as nickel (ug/L as Ni)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, nickel, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Lithium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as lithium (ug/L as Li)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw

TABLE 3. WQ PARAMETERS AT PETE

TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	LITHIUM WWR-ICP
DETECTION LIMIT	12
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Selenium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as selenium (ug/L as Se)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, selenium, water, WWR
DETECTION LIMIT	1.0
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Silver
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as silver (ug/L as Ag)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw

TABLE 3. WQ PARAMETERS AT PETE

TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, silver, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Lead
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as lead (ug/L as Pb)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, lead, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Iron
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as iron (ug/L as Fe)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw

TABLE 3. WQ PARAMETERS AT PETE

TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	IRON WWR-ICP
DETECTION LIMIT	14
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Mercury
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as mercury (ug/L as Hg)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ +K ₂ Cr ₂ O ₇ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	AA, manual cold vapor, mercury, WWR
DETECTION LIMIT	0.100
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Barium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as barium (ug/L as Ba)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw

TABLE 3. WQ PARAMETERS AT PETE

TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	BARIUM WWR-ICP
DETECTION LIMIT	1.2
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Beryllium
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as beryllium (ug/L as Be)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	BERYLLIUM WWR-ICP
DETECTION LIMIT	4
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Copper
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as copper (ug/L as Cu)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual

TABLE 3. WQ PARAMETERS AT PETE

PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, copper, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Cobalt
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as cobalt (ug/L as Co)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	GFAA, cobalt, WWR
DETECTION LIMIT	1.000
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Aluminum
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as aluminum (ug/L as Al)
FIELD/LAB MEASUREMENT	lab

TABLE 3. WQ PARAMETERS AT PETE

VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	ALUMINUM WWR-ICP
DETECTION LIMIT	28
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Manganese
SAMPLE FRACTION	total
MEASUREMENT UNITS	micrograms per liter as manganese (ug/L as Mn)
FIELD/LAB MEASUREMENT	lab
VALUE TYPE	actual
PREPARATION PROCEDURES	raw
TRANSPORT/PRESERVATION	acidified to pH<2 with HNO ₃ ; cooled to 4°C
LAB ANALYTICAL PROCEDURE; SOURCE	S197 USGS National Water-Quality Laboratory Trace Metals, WWR; Inorganics: Major Ions and Trace Metals; USGS National Water-Quality Laboratory
FIELD/LAB EQUIPMENT OR PROCEDURE	MANGANESE WWR-ICP
DETECTION LIMIT	3
PERSON/AGENCY THAT ANALYZED	USGS National Water-Quality Laboratory

PARAMETER NAME	Total Coliform (TC)
SAMPLE FRACTION	total
MEASUREMENT UNITS	colonies per 100 milliliters (col/100mL)
FIELD/LAB MEASUREMENT	field

TABLE 3. WQ PARAMETERS AT PETE

VALUE TYPE	calculated
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	incubated, 24 hours at 35 °C
LAB ANALYTICAL PROCEDURE; SOURCE	membrane/vacuum filtration
FIELD/LAB EQUIPMENT OR PROCEDURE	hand-dip method
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)

PARAMETER NAME	Fecal Coliform (FC)
SAMPLE FRACTION	total
MEASUREMENT UNITS	colonies per 100 milliliters (col/100mL)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	calculated
PREPARATION PROCEDURES	filtered, 0.65 microns
TRANSPORT/PRESERVATION	incubated, 24 hours at 44.5 °C
LAB ANALYTICAL PROCEDURE; SOURCE	membrane/vacuum filtration
FIELD/LAB EQUIPMENT OR PROCEDURE	hand-dip method
DETECTION LIMIT	--
PERSON/AGENCY WHO ANALYZED	Mike Gearheart (USGS)

PARAMETER NAME	Fecal Streptococcus (FS)
SAMPLE FRACTION	total
MEASUREMENT UNITS	colonies per 100 milliliters (col/100mL)
FIELD/LAB MEASUREMENT	field
VALUE TYPE	calculated
PREPARATION PROCEDURES	filtered, 0.45 microns
TRANSPORT/PRESERVATION	incubated, 48 hours at 35 °C
LAB ANALYTICAL PROCEDURE; SOURCE	membrane/vacuum filtration

TABLE 3. WQ PARAMETERS AT PETE

FIELD/LAB EQUIPMENT OR PROCEDURE	hand-dip method
DETECTION LIMIT	--
PERSON/AGENCY THAT ANALYZED	Mike Gearheart (USGS)

TABLE 2. WQ DATA AT PETE

[--, no data available]

Station Name	Station ID	Date	Time	Medium	Sampling Depth	Sample Collector
		mm/dd/yy	hh:mm:ss		feet	
Harrison Creek at Siege Rd at Petersburg, VA	02041758	09/09/98	12:30:00	Water	0.5	J. Michael Gearheart (USGS)
Harrison Creek at Siege Rd at Petersburg, VA	02041758	12/08/98	11:15:00	Water	0.5	J. Michael Gearheart (USGS)
Harrison Creek at Siege Rd at Petersburg, VA	02041758	02/09/99	11:35:00	Water	0.3	J. Michael Gearheart (USGS)
Harrison Creek at Siege Rd at Petersburg, VA	02041758	06/22/99	9:35:00	Water	0.2	J. Michael Gearheart (USGS)
Harrison Creek at Hwy 36 at Petersburg, VA	02041760	09/09/98	9:30:00	Water	0.8	J. Michael Gearheart (USGS)
Harrison Creek at Hwy 36 at Petersburg, VA	02041760	12/08/98	8:45:00	Water	0.5	J. Michael Gearheart (USGS)
Harrison Creek at Hwy 36 at Petersburg, VA	02041760	02/09/99	13:50:00	Water	0.4	J. Michael Gearheart (USGS)
Harrison Creek at Hwy 36 at Petersburg, VA	02041760	06/22/99	12:00:00	Water	0.3	J. Michael Gearheart (USGS)
Poor Creek at Hwy 460 at Petersburg, VA	02041745	09/10/98	10:00:00	Water	0.5	J. Michael Gearheart (USGS)
Poor Creek at Hwy 460 at Petersburg, VA	02041745	12/09/98	10:00:00	Water	0.4	J. Michael Gearheart (USGS)
Poor Creek at Hwy 460 at Petersburg, VA	02041745	02/10/99	9:30:00	Water	0.3	J. Michael Gearheart (USGS)
Poor Creek at Hwy 460 at Petersburg, VA	02041745	06/23/99	10:30:00	Water	1.0	J. Michael Gearheart (USGS)
Poor Creek nr Blandford Cemetery at Petersburg, VA	02041748	09/09/98	15:30:00	Water	0.5	J. Michael Gearheart (USGS)
Poor Creek nr Blandford Cemetery at Petersburg, VA	02041748	12/08/98	13:30:00	Water	1.0	J. Michael Gearheart (USGS)
Poor Creek nr Blandford Cemetery at Petersburg, VA	02041748	02/10/99	12:25:00	Water	0.4	J. Michael Gearheart (USGS)
Poor Creek nr Blandford Cemetery at Petersburg, VA	02041748	06/23/99	13:00:00	Water	1.0	J. Michael Gearheart (USGS)
Hatchers Run at Rt 627 nr Five Forks, VA	02046265	09/10/98	13:10:00	Water	0.5	J. Michael Gearheart (USGS)
Hatchers Run at Rt 627 nr Five Forks, VA	02046265	12/09/98	13:20:00	Water	0.5	J. Michael Gearheart (USGS)
Hatchers Run at Rt 627 nr Five Forks, VA	02046265	02/09/99	9:00:00	Water	0.9	J. Michael Gearheart (USGS)
Hatchers Run at Rt 627 nr Five Forks, VA	02046265	06/22/99	14:45:00	Water	2.0	J. Michael Gearheart (USGS)

TABLE 2. WQ DATA AT PETE

Station ID	Discharge	Specific Conductance - field	pH - field	Water Temperature
	cubic feet per second	microsiemens per centimeter at 25 degrees Celsius	standard pH units	degrees Celsius
02041758	0.001	143	7.5	18.0
02041758	0.02	180	7.5	15.7
02041758	0.33	184	7.8	6.3
02041758	0.120	149	6.8	17.8
02041760	0.10	81	6.8	17.3
02041760	0.14	81	6.7	16.1
02041760	0.58	138	7.3	9.5
02041760	0.179	103	6.8	18.2
02041745	0.09	185	7.4	19.2
02041745	1.2	84	6.9	13.0
02041745	0.14	305	7.6	7.5
02041745	0.026	217	7.2	17.9
02041748	0.10	163	7.3	18.6
02041748	0.07	240	7.5	16.1
02041748	0.65	241	7.5	9.1
02041748	0.133	183	7.6	19.4
02046265	0.03	79	6.6	22.3
02046265	0.54	117	6.2	13.4
02046265	3.5	51	6.3	5.9
02046265	3.68 estimated as 5% greater than last	53	6.2	21.0

TABLE 2. WQ DATA AT PETE

Station ID	Dissolved Oxygen	Total Coliform	Fecal Coliform
	milligrams per liter	colonies per 100 milliliters	colonies per 100 milliliters
02041758	8.2	650	520
02041758	7.7	770	430
02041758	12.4	190	23 non-ideal colony count
02041758	8.2	620	620
02041760	7.5	>270	1,100
02041760	6.7	140 non-ideal colony count	65 non-ideal colony count
02041760	10.6	1,200	40 non-ideal colony count
02041760	6.6	1,600	400
02041745	7.5	2,700 non-ideal colony count	2,000 non-ideal colony count
02041745	9.3	20,000 non-ideal colony count	20,000 non-ideal colony count
02041745	11.3	1,300	>180
02041745	6.9	4,300	1,475 non-ideal colony count
02041748	8.0	1,900 non-ideal colony count	>210
02041748	7.8	3,000	110 non-ideal colony count
02041748	11.8	450	39 non-ideal colony count
02041748	7.0	3,100	260
02046265	5.1	450	450
02046265	5.4	7,500	5,800
02046265	8.3	940	30 non-ideal colony count
02046265	3.6	6,100	177

TABLE 2. WQ DATA AT PETE

Station ID	Fecal Streptococcus	Calcium - Dissolved <i>detection limit = 0.020</i>	Magnesium - Dissolved <i>detection limit = 0.004</i>
	colonies per 100 milliliters	micrograms per liter as calcium	milligrams per liter as magnesium
02041758	500	18	2.0
02041758	1,000	--	--
02041758	85 non-ideal colony count	--	--
02041758	2,500	--	--
02041760	540	6.9	1.2
02041760	630	--	--
02041760	48 non-ideal colony count	--	--
02041760	940	--	--
02041745	650	20	2.7
02041745	10,000	--	--
02041745	690	--	--
02041745	1,120	--	--
02041748	1,200	17	3.0
02041748	300	--	--
02041748	35 non-ideal colony count	--	--
02041748	350	--	--
02046265	8 non-ideal colony count	4.5	1.5
02046265	2,500	--	--
02046265	36 non-ideal colony count	--	--
02046265	1,060	--	--

TABLE 2. WQ DATA AT PETE

Station ID	Sodium - Dissolved <i>detection limit = 0.06</i> milligrams per liter as sodium	Potassium - Dissolved <i>detection limit = 0.100</i> milligrams per liter as potassium	Alkalinity - field milligrams per liter as calcium carbonate	Alkalinity - lab <i>detection limit = 1</i> microsiemens per centimeter at 25 degrees Celsius
02041758	5.9	2.8	46	49
02041758	--	--	53	--
02041758	--	--	38	--
02041758	--	--	50.2	--
02041760	4.5	2.1	30	30
02041760	--	--	20	--
02041760	--	--	29	--
02041760	--	--	30.5	--
02041745	8.4	3.0	39	42
02041745	--	--	12	--
02041745	--	--	44	--
02041745	--	--	51.0	--
02041748	7.2	3.0	40	39
02041748	--	--	62	--
02041748	--	--	27	--
02041748	--	--	44.0	--
02046265	5.1	2.3	11	12
02046265	--	--	10	--
02046265	--	--	6	--
02046265	--	--	13.2	--

TABLE 2. WATER DATA AT PETE

Station ID	Sulfate - Dissolved <i>detection limit = 0.100</i> milligrams per liter as sulfate	Chloride - Dissolved <i>detection limit = 0.100</i> milligrams per liter as chloride	Fluoride - Dissolved <i>detection limit = 0.100</i> milligrams per liter as fluoride	Silica - Dissolved <i>detection limit = 0.100</i> milligrams per liter as silica dioxide
02041758	8.5	7.3	0.15	16
02041758	--	--	--	--
02041758	--	--	--	--
02041758	--	--	--	--
02041760	2.7	6.8	<0.10	18
02041760	--	--	--	--
02041760	--	--	--	--
02041760	--	--	--	--
02041745	16	14	0.69	17
02041745	--	--	--	--
02041745	--	--	--	--
02041745	--	--	--	--
02041748	18	10	0.48	19
02041748	--	--	--	--
02041748	--	--	--	--
02041748	--	--	--	--
02046265	13	4.3	0.12	10
02046265	--	--	--	--
02046265	--	--	--	--
02046265	--	--	--	--

TABLE 2. WQ DATA AT PETE

Station ID	Nitrogen, Nitrite - Dissolved <i>detection limit = 0.010</i> milligrams per liter as nitrogen	NO2 + NO3 - Dissolved <i>detection limit = 0.050</i> milligrams per liter as nitrogen	Nitrogen Ammonia - Dissolved <i>detection limit = 0.10</i> milligrams per liter as nitrogen	Nitrogen, Amn & Org - Total <i>detection limit = 0.10</i> milligrams per liter as nitrogen
02041758	<0.010	<0.050	<0.020	0.24
02041758	<0.01	<0.05	<0.02	0.2
02041758	<0.01	<0.05	<0.02	0.2
02041758	<0.01	0.08	0.03	0.3
02041760	<0.010	0.081	0.085	0.15
02041760	<0.01	0.06	0.03	0.2
02041760	<0.01	<0.05	0.04	0.2
02041760	<0.01	0.08	0.06	0.3
02041745	0.031	0.316	0.410	0.65
02041745	0.01	0.27	0.07	0.5
02041745	<0.01	0.2	0.04	0.3
02041745	0.01	0.22	0.04	0.4
02041748	0.01	0.185	0.205	0.35
02041748	<0.01	<0.05	<0.02	0.2
02041748	<0.01	0.11	0.03	0.2
02041748	<0.01	0.12	0.03	0.3
02046265	<0.010	<0.050	0.04	0.83
02046265	<0.01	0.09	<0.02	0.4
02046265	<0.01	<0.05	<0.02	0.3
02046265	<0.01	<0.05	<0.02	0.7

TABLE 2. WQ DATA AT PETE

Station ID	Nitrogen, Amn & Org - Dissolved	Phosphorous - Total	Phosphorous - Dissolved
	<i>detection limit = 0.10</i> milligrams per liter as nitrogen	<i>detection limit = 0.005</i> milligrams per liter as phosphorous	<i>detection limit = 0.005</i> milligrams per liter as phosphorous
02041758	0.17	0.046	<0.010
02041758	0.2	0.05 estimated value	0.03 estimated value
02041758	0.1	0.013	0.0052
02041758	0.2	0.037	0.02
02041760	0.13	0.036	0.029
02041760	0.1	0.08	<0.05
02041760	0.1	0.024	0.015
02041760	0.2	0.053	0.022
02041745	0.63	0.085	0.058
02041745	0.5	0.08	0.07
02041745	0.2	0.0219	0.0054
02041745	0.3	0.064	0.015
02041748	0.33	0.05	0.048
02041748	0.2	0.05 estimated value	<0.05
02041748	0.1	0.018	<0.004
02041748	0.2	0.04	0.015
02046265	0.53	0.034	<0.010
02046265	0.4	0.03 estimated value	<0.05
02046265	0.3	0.015	0.006
02046265	0.5	0.063	0.009

TABLE 2. WQ DATA AT PETE

Station ID	Orthophosphate - Dissolved <i>detection limit = 0.010</i> milligrams per liter as phosphorous	Aluminum - Total <i>detection limit = 28</i> micrograms per liter as aluminum	Arsenic - Total <i>detection limit = 1.000</i> micrograms per liter as arsenic	Barium - Total <i>detection limit = 1.2</i> micrograms per liter as barium
02041758	0.019	--	--	--
02041758	0.03	--	--	--
02041758	<0.01	--	--	--
02041758	0.02	84.3	1	46.0
02041760	0.029	--	--	--
02041760	0.02	--	--	--
02041760	0.02	--	--	--
02041760	0.03	47.9	1	38.3
02041745	0.061	--	--	--
02041745	0.08	--	--	--
02041745	<0.01	--	--	--
02041745	0.02	69.8	<1	39.5
02041748	0.028	--	--	--
02041748	0.02	--	--	--
02041748	<0.01	--	--	--
02041748	0.02	67.2	1	39.4
02046265	<0.010	--	--	--
02046265	0.01	--	--	--
02046265	<0.01	--	--	--
02046265	<0.01	137	2	44.0

TABLE 2. WQ DATA AT PETE

Station ID	Beryllium - Total <i>detection limit = 4</i> micrograms per liter as beryllium	Boron - Dissolved <i>detection limit = 16</i> micrograms per liter as boron	Cadmium - Total <i>detection limit = 1.000</i> micrograms per liter as cadmium	Chromium - Total <i>detection limit = 1.000</i> micrograms per liter as chromium
02041758	--	25	--	--
02041758	--	--	--	--
02041758	--	--	--	--
02041758	<4	--	<1	<1.0
02041760	--	<16	--	--
02041760	--	--	--	--
02041760	--	--	--	--
02041760	<4	--	<1	<1.0
02041745	--	19	--	--
02041745	--	--	--	--
02041745	--	--	--	--
02041745	<4	--	<1	<1.0
02041748	--	25	--	--
02041748	--	--	--	--
02041748	--	--	--	--
02041748	<4	--	<1	<1.0
02046265	--	21	--	--
02046265	--	--	--	--
02046265	--	--	--	--
02046265	<4	--	1	1.5

TABLE 2. WQ DATA AT PETE

Station ID	Cobalt - Total <i>detection limit = 1.000</i> micrograms per liter as cobalt	Copper - Total <i>detection limit = 1.000</i> micrograms per liter as copper	Iron - Total <i>detection limit = 14</i> micrograms per liter as iron	Iron - Dissolved <i>detection limit = 10.000</i> micrograms per liter as iron
02041758	--	--	--	34
02041758	--	--	--	--
02041758	--	--	--	--
02041758	<1	1	783	--
02041760	--	--	--	560
02041760	--	--	--	--
02041760	--	--	--	--
02041760	1	2	975	--
02041745	--	--	--	120
02041745	--	--	--	--
02041745	--	--	--	--
02041745	1	1	926	--
02041748	--	--	--	87
02041748	--	--	--	--
02041748	--	--	--	--
02041748	<1	1	739	--
02046265	--	--	--	500
02046265	--	--	--	--
02046265	--	--	--	--
02046265	2	3	6,690	--

TABLE 2. WQ DATA AT PETE

Station ID	Lead - Total <i>detection limit = 1.000</i> micrograms per liter as lead	Lithium - Total <i>detection limit = 12</i> micrograms per liter as lithium	Manganese - Total <i>detection limit = 3</i> micrograms per liter as manganese	Manganese - Dissolved <i>detection limit = 3.0</i> micrograms per liter as manganese
02041758	--	--	--	17
02041758	--	--	--	--
02041758	--	--	--	--
02041758	<1	<12	37.9	--
02041760	--	--	--	159
02041760	--	--	--	--
02041760	--	--	--	--
02041760	<1	<12	105	--
02041745	--	--	--	39
02041745	--	--	--	--
02041745	--	--	--	--
02041745	<1	<12	64.9	--
02041748	--	--	--	25
02041748	--	--	--	--
02041748	--	--	--	--
02041748	<1	<12	39.7	--
02046265	--	--	--	693
02046265	--	--	--	--
02046265	--	--	--	--
02046265	<1	<12	421	--

TABLE 2. WQ DATA AT PETE

Station ID	Mercury - Total <i>detection limit = 0.100</i> micrograms per liter as mercury	Molybdenum - Total <i>detection limit = 1.000</i> micrograms per liter as molybdenum	Nickel - Total <i>detection limit = 1.000</i> micrograms per liter as nickel	Selenium - Total <i>detection limit = 1.0</i> micrograms per liter as selenium
02041758	--	--	--	--
02041758	--	--	--	--
02041758	--	--	--	--
02041758	<0.1	1.2	<1	<1
02041760	--	--	--	--
02041760	--	--	--	--
02041760	--	--	--	--
02041760	<0.1	<1.0	1	1
02041745	--	--	--	--
02041745	--	--	--	--
02041745	--	--	--	--
02041745	<0.1	<1.0	2	<1
02041748	--	--	--	--
02041748	--	--	--	--
02041748	--	--	--	--
02041748	<0.1	1	2	<1
02046265	--	--	--	--
02046265	--	--	--	--
02046265	--	--	--	--
02046265	<0.1	<1.0	<1	<1

TABLE 2. WQ DATA AT PETE

Station ID	Silver - Total	Zinc - Total
	<i>detection limit = 1.000</i>	<i>detection limit = 40</i>
	micrograms per liter as silver	micrograms per liter as zinc
02041758	--	--
02041758	--	--
02041758	--	--
02041758	<1	<40
02041760	--	--
02041760	--	--
02041760	--	--
02041760	<1	<40
02041745	--	--
02041745	--	--
02041745	--	--
02041745	<1	<40
02041748	--	--
02041748	--	--
02041748	--	--
02041748	<1	<40
02046265	--	--
02046265	--	--
02046265	--	--
02046265	<1	<40