SURFACE WATER QUALITY MONITORING PLAN

ANTIETAM NATIONAL BATTLEFIELD

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INTRODUCTION

Antietam National Battlefield is located in Washington County, Sharpsburg Maryland. The Battlefield is located approximately 67 miles Northwest of Washington D.C., 65 miles West of Baltimore, Maryland and 12 miles South of Hagerstown, Maryland. A Congressional Act of August 30, 1890, appropriated money for the preservation of the lines of battle of the Army of the Potomac and the Army of Northern Virginia at Antietam. This Congressional Act was to establish the Antietam National Battlefield for the purpose of preserving the cultural and natural resources as a significant moment of Civil War history for the awareness and inspiration of this and future generations of people.

Perhaps the most important natural resource within the battlefield is the Antietam Creek. It was along the banks of this creek that General Robert E. Lee elected to make his stand against General George B. McClellan and it was after this creek that the federals named the battle which took place September 17, 1862. It is for these reasons that the water quality of Antietam Creek as well as the quality of all other streams in the battlefield, must be monitored to maintain their historical integrity.

There are a number of potential water pollution threats to Antietam National Battlefield which include:

1) Agricultural Runoff. The area around the battlefield is primary rural farmland. The current agricultural pactices have the potential to contribute to increased turbidity, bacteria and nutrient levels. At times rains can be heavy enough to wash fertilizers, pesticides, and animal effluent into the streams.

2) Urban and Residential. One stream originates at a spring in the town of Sharpsburg. From there it runs across park property and into Antietam Creek. A majority of the storm sewer runoff from the town of Sharpsburg spills into this stream. The potential for heavy metals and chemical pollutants is great.

3) Sewage Treatment Plants. A sewage treatment plant for the City of Hagerstown, Maryland is situated along the banks of Antietam Creek approximately 10 miles to the North of the park. A malfunction of this plant could result in potential water quality problems in the park.

4) Recreational Activities: The park streams are not being managed for recreational use, however these activities do take place. These activities pose a potential threat to water quality, especially in locations and seasons of concentrated use.

It is important that Antietam National Battlefield initiate the following Water Quality Monitoring Program to understand the current condition of the park water resources. The program would also provide important water quality information necessary for making management decisions concerning the protection of the water resources.

Although some monitoring has been done by the State of Maryland, the Environmental Protection Agency and the U.S. Geological Survey, only a limited amount of that data is specific to the park. Quantitative data is available for the Antietam Creek. No other parameters have been examined within the park.

OBJECTIVES

1) To gather water quality data to determine the current conditions of the park's water resources.

2) To gather water quality data to determine long term trends in water quality.

SAMPLE SITES

The park will monitor three distinct water bodies.

1. Antietam Creek. This is the major water body within the park. This creek flows in a north/south direction through Washington County Maryland, and is one of the major tributaries to the Potomac River. Approximately two miles of the Antietam flow through or adjacent to the battlefield with an average gradient of 7.9 feet per mile. The groundwater is an alkaline, calcium bicarbonate in nature. The creek flows through a Hagerstown - Duffield - Frankstown Soils Association, soils of limestone valleys, as it appears on the General Soil Map for Washington County, Maryland. The major portion of the Antietam flows through soils that are deep, well drained and are moderately or moderately rapidly permeable with slopes from 0 to 10 or 15 percent. A small portion of the soils are all rocky, very rocky, or extremely rocky with slopes of 8 to 15 percent, according to the natural soil groups map for Washington County Maryland. More specifically the major soil through which the creek carves its way is the Huntington silt loam. This soil falls into capability unit I-6 which consists of nearly level, well-drained, friable soils on flood plains and on low stream terraces. The Woodland suitability group for this soil is F1, and excellent soil for Woodland. With the exception of the portion of the Antietam that flows through the City of Hagerstown. The creek is bordered predominantly by agricultural crop and pasture-land and by forested land made up of the oak-hickory hardwood group.

   There are three sample stations on this creek. One located at a point where the creek enters park property, one at the historic Burnside Bridge, just below an area with high recreational use, and a third station as the creek leaves park property. (See attachment #1).

2. Mumma Spring. This stream is fed by a natural spring on the historic Mumma Farm flowing to a holding pond off of park property. This stream flows through the Hagerstown - Duffield - Frankstown General Soil Association, soils of limestone valleys. The natural soils groups are initially the deep, well drained soils that are moderately or moderately rapidly permeable with slopes of 0 to 10 percent. This rapidly changes to the all rocky soils with slopes of 15+ percent. The more specific soil types are the Hagerstown silt loam 0 to 8 percent slopes, moderately eroded. This unit falls into capability unit IIe-1, deep well drained, gently sloping soils that have a friable surface layer, developed in or strongly influenced by material that weathered from limestone. The second major soil type is the Hagerstown very rocky silty clay loam, 3 to 15 percent slopes, moderately eroded. This type is assigned capability unit VIs-1, sloping to steep, well drained, very rocky soils that are limited by rockiness and by hazard of erosion, the rocks are outcrops of limestone.

   The stream flows through an area that was pastured. It has now been allowed to grow up and return to an old field situation.

   There are two sample stations on the stream, one at the source, and one at the point the stream leaves park property (See attachment #1).

3. Sharpsburg Creek. This stream originates at a natural spring in the town of Sharpsburg. It is also fed by storm sewers and a small pond off of

park property. The General Soil Association is the Hagerstown - Duffield - Frankstown Association, soils of limestone valleys. The stream flows through the same natural soils groups as does Antietam Creek, (see above). The more specific soil types include a small portion of rocky eroded land, capability unit VIIs-1, severely eroded, very rocky soils, the result of massive outcrops of limestone. The majority of the stream flows through the Huntington silt loam. (See Antietam Creek above for a description of this soil).

Approximately one-fourth of the length of the stream is bordered by the town of Sharpsburg another one-fourth is bordered by agricultural pasture-land, and approximately one half of the stream flows through woodland of the Oak-Hickory-Maple hardwood group. Three sample stations have been located on this stream, one as the stream enters the park, a second site midway on the stream, on the pasture/woodland border, and a third station just before the stream enters Antietam Creek (See attachment #1).

PARAMETERS

1. Flow

The United States Geological Survey currently maintains a stream gauging station on the Antietam Creek, within the park boundary. Results from this station will be obtained and correlated with sample dates. A stage discharge rating curve will be developed for the Sharpsburg Creek and possibly the Mumma Spring if it is feasible. Staff gauges will be established on these sites. Discharge will be recorded in cubic feet per second.

2. Ph

Ph will be recorded for each sample station. Ph is an index of the acidity or basicity of water. This measurement can give an indication as to whether acid or bases have been added to the water sources. Fertilization and sewage disposal can have an effect on Ph. Measurements will be taken with a Chemtrix Inc. type 40E Ph Meter.

3. Water Temperature

Water temperature will be recorded at each sample station. Temperature is necessary to help explain fluctuations in other parameters and pollutants. Temperature will be measured with a standard thermometer and recorded to the nearest 0.1 degree C.

4. Electrical Conductivity

Electrical conductivity (EC) will be recorded for each sample station. E.C. is the ability of a water sample to conduct electricity. This is a good measure for inorganic pollutants including salts used in road deicing, nitrates and phosphates in sewage and manures and inorganic nutrients in fertilizers. E.C. will be measured with a HACH Co. mini conductivity meter model 17280 to the nearest ten micromhos/cm.

5. Turbidity

Turbidity will be recorded for each sample station. It is a measure of the extent to which the intensity of light passing through a water sample is reduced by suspended matter. Turbidity can be effected by various agricultural practices and can effect fish and plant life by reducing the penetration of sunlight which is vital to these organisms. Turbidity will be measured with a HACH Co. Laboratory Turbidimeter Model 2100A to the nearest 0.01 nephelometric turbidity units.

6. Alkalinity

Alkalinity will be recorded for each sample station. This is the ability of a water sample to neutralize an acid. It can determine how well water can resist changes in ph, or how well it is "buffered." Alkalinity has an indirect effect on the toxicity of certain pollutants in the water. Alkalinity will be measured using the titration method from the HACH Co. Fish Farmer's Water Quality Test Kit Model FF-1A, and recorded to the nearest grains per gallon calcium carbonate.

7. Dissolved Oxygen

Dissolved oxygen (D.O.) will be measured for each sample station. D.O. is a measure of the amount of unbound oxygen in water. It is generally considered significant in the protection of asthetic qualities of water as well as in the maintenance of diverse aquatic life. D.O. is often effected by organic waste loading, and pesticide applications. D.O. will be recorded to the nearest Mg/L dissolved oxygen and will be determined using HACH Co. Fish Farmer's Water Quality Test Kit Model FF-1A.

8. Nitrogen

Ammonium nitrogen and nitrate nitrogen will be recorded for each sample site. Nitrogen is a nutrient which occurs in freshwater systems in several forms including ammonia, nitrate and numerous organic forms. Sources of nitrogen include effluent from sewage treatment plants, and runoff from agricultural and residential areas. Ammonium nitrogen will be measured using the HACH Co. Fish Farmer's Kit and nitrate nitrogen will be measured using the HACH Co. Nitrate Test Kit Model NI-11. Results will be recorded to the nearest 0.01 Mg/L Ammonium Nitrogen and 0.1 Mg/L nitrate nitrogen respectively.

9. Chloride

Chloride will be recorded for each sample station. Chlorides in fresh waters can derive from human or animal sewage or from road salts spread for de-icing purposes. Chloride will be measured using the titration method from the HACH Co. Fish Farmer Test Kit and will be recorded to the nearest 10 Mg/L sodium chloride.

10. Phosphorus

Phosphate will be recorded for each sample station. Phosphates in wastes are the primary source of excess amounts of nutrients in water. Phosphorus will be measured using the HACH Co. Orthophosphate Test Kit Model PO-19 and will be recorded to the nearest 0.01 Mg/L phosphate, this result can then be converted to Mg/L phosphorus.

11. Fecal Coliforms

Fecal coliforms will only be recorded for those sample stations on Antietam Creek that exhibit high recreational use. The presence of coliform bacteria is a good indicator of fecal contamination and one of the most frequently applied indicators of water quality. Samples for fecal coliforms will be collected and delivered to the Maryland State Department of Health and Mental Hygiene Laboratory in Frederick, Maryland. The laboratory will complete the tests and mail the results to the park.

SAMPLE FREQUENCY

All parameters, with the exception of fecal coliforms, will be measured once per month on a year round basis. Fecal coliforms will be measured once every two weeks on a seasonal basis only.

DATA ANALYSIS

To make the data obtained through this monitoring program useful to park managers, both on a current and long-term basis, the following format will be used to record and display all data. Data will be recorded on standard data sheets. (See attachment #2) All appropriate blocks must be filled in at the time of analysis. The data will be stored on a D Base III Database File in use with the Resource Management computer. The computer will facilitate data display and comparison. Graphs will also be prepared on a yearly basis to display the following: 1) Yearly trends, one bar representing one years data for each parameter at each site, 2) Yearly trends for each parameter, for each stream as a whole, 3) A yearly comparison of differences between sites for each parameter, 4) A yearly comparison for each month's data for each parameter at each site.

CONCLUSION

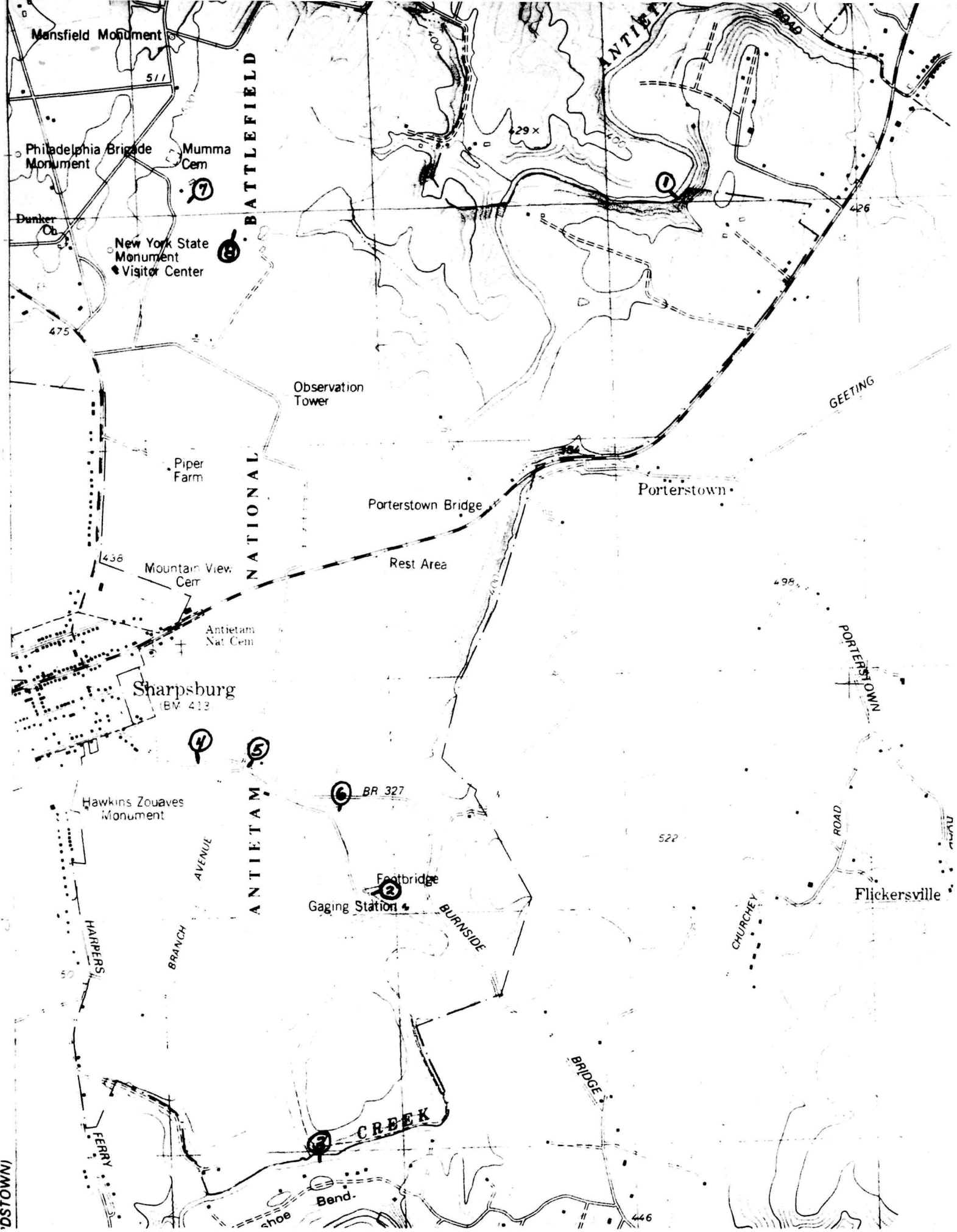
It is realized that the data being collected will not be of the quality to pinpoint any but the most blatant pollution sources, and that is not the intent of this program. The data will be of the quality to determine gradual long term trends in water quality and to determine the current, general quality of park streams. It will also be useful in identifying the presence of a gross amount of a pollutant that might enter park water and will give documentation to that effect.

Attachment #1

Sample station locations and numbers for Antietam National Battlefield Surface Water Quality Monitoring Program.

Appearing on the Keedysville, Quadrangle 7.5 minute U.S.G.S. Topographical map.

1. Antietam Creek entering park
2. Antietam Creek at Burnside Bridge
3. Antietam Creek leaving park
4. Sharpsburg Creek entering park
5. Sharpsburg Creek midway on stream
6. Sharpsburg Creek entering the Antietam
7. Mumma Spring at source
8. Mumma Spring leaving park


Mansfield Monument
511
Philadelphia Brigade Monument
Mumma Cem
Dunker Ch
New York State Monument
Visitor Center
BATTLEFIELD
NATIONAL
475
Observation Tower
Piper Farm
Porterstown Bridge
Porterstown
GEETING
436
Mountain View Cem
Rest Area
Antietam Nat Cem
Sharpsburg
BM 413
ANTIETAM
BR 327
Hawkins Zouaves Monument
AVENUE
Footbridge
Gaging Station
BURNSIDE
HARPERS
BRANCH
522
ROAD
Flickersville
CHURCHEY
BRIDGE
CREEK
FERRY
Bend.
446
426
498
PORTERSTOWN

Attachment #2

WATER QUALITY DATA SHEET

Site #								
Date								
Time								
Water Temp.								
Ph								
Elec. Cond								
Diss. Oz.								
Nitrate N.								
Ammon. N.								
Chloride								
Orthophosphate								
Alkalinity								
Turbidity								
Flow								
Fecal Coliform								
Remarks								